



Final Examination For 1st year Students (General Chemistry II, C105)

ملحوظة هامة: الإمتحان مكون من أربع صفحات

A-Organic Chemistry (25 Marks)

(I) Check (✓) or (x) on the following: (12 Marks)

1. The boiling point of branched alkanes is higher than the n-alkanes.
2. Cis-trans isomers possible for 1-butane and 2-butane.
3. Isopropyl cation is more stable than propyl cation.
4. Hydrogen add to alkenes in presence of Ni.
5. Formal charge allows chemist to determine the carbon atoms in the molecule.
6. sp^3 orbital of any particular carbon atom is directed toward the corner of the triangle.
7. Isomerism is: the molecules that have the same kind and numbers of atoms.
8. Heat is required to break C-C bond of ethane to give the methyl radicals.
9. Two different atoms with two different electronegativities called polar covalent bond.
10. Molecular formula of n-propanol and t-propanol are the same.
11. Hydration of ethene gave ethanol.
12. Ethane and ethene molecules have the same molecular formula.

(II) Choose the correct answer: (13 Marks)

1. In 1,3-butadiene, the double bonds are:
a- cumulated b- conjugated c- isolated
2. Hydration of cyclohexene gives:
a- cyclohexane b- cyclohexanol c- cyclohexenol
3. Ethylene is similar to ethane that both have the same:
a- molecular formula b- structural formula c- number of carbons
4. In ethane, the total number of covalent bonds is:
a-5 b-6 c-7
5. Methyl formate is the isomer of:
a-acetic acid b- formic acid
6. The general formula RSH is:
a-acid b-ester c-non
7. Nucleophiles are:
a- electron rich reagents b-electron poor reagents

5. For a specific reaction, which of the following statements can be made about K , the equilibrium constant?
 - (a) It always remains the same at different reaction conditions.
 - (b) It changes with changes in the temperature.
 - (c) It increases if the concentration of one of the products is increased.
6. The pOH of a solution of NaOH is 11.30. What is the $[H^+]$ for this solution?
 - (a) 2.0×10^{-3}
 - (b) 2.5×10^{-3}
 - (c) 5.0×10^{-12}
7. The $[H^+]$ in a 0.050 M solution of $Ba(OH)_2$ is:
 - (a) $1.0 \times 10^{-5} M$
 - (b) $5.0 \times 10^{-2} M$
 - (c) $1.0 \times 10^{-13} M$
8. A solution in which $[H^+] = 10^{-8} M$ has a pH of and is
 - (a) 8, acidic
 - (e) 8, basic
 - (b) 6, basic
9. The pH of a 0.02 M solution of an unknown weak acid is 3.7. What is the pK_a of this acid?
 - (a) 5.7
 - (b) 4.9
 - (c) 3.2
10. Which of the following solutions has the lowest pH at $25^\circ C$? (No calculations required.)
 - (a) 0.2 M sodium hydroxide
 - (d) 0.2 M benzoic acid
 - (e) pure water
11. What is the pH of 0.060 M NH_4Cl ? ($K_b NH_4OH = 1.8 \times 10^{-5}$ and $K_w = 1 \times 10^{-14}$)
 - (a) 5.06
 - (b) 5.24
 - (c) 5.35
12. What is the pH of a solution composed of 0.20 M NH_3 and 0.15 M NH_4Cl ? ($K_b = 1.8 \times 10^{-5}$).
 - (a) 2.15
 - (b) 8.26
 - (c) 9.38
13. The solubility product expression for tin(II) hydroxide, $Sn(OH)_2$, is
 - (a) $[Sn^{2+}]^2[OH^-]$
 - (b) $[Sn^{2+}][OH^-]^2$
 - (c) $[Sn^{2+}][OH^-]^3$

14. The solubility of Ag_2SO_4 in water at 100°C is approximately 1.4 g per 100 mL. What is the solubility product of this salt at 100°C ? (molar mass of Ag_2SO_4 is 311.8g/mol)
- (a) 5.7×10^{-8}
 (b) 4.1×10^{-5}
 (c) 3.6×10^{-4}
15. When we mix together, from separate sources, the ions of a slightly soluble ionic salt, the salt will precipitate if $Q_{\text{sp}} \dots\dots\dots K_{\text{sp}}$, and will continue to precipitate until $Q_{\text{sp}} \dots\dots\dots K_{\text{sp}}$.
- (a) is greater than; equals
 (b) is less than; is greater than
 (c) is less than; equals

II) Put true (✓) or false (x) for the following statements: (10 Marks)

1. At equilibrium, the concentrations of the reactants and products will be equal. ()
2. The value of the equilibrium constant, K , depends on the temperature at which the reaction is happening. ()
3. A large value of K tells us that the reaction lies to the left ()
4. Increasing the temperature of the surroundings shifts the position of equilibrium in favour of exothermic reactions ()
5. A chemical equilibrium is a dynamic equilibrium. ()
6. The ion is completely precipitated if 99.0% of it is precipitated and only about 1.0% is left in solution. ()
7. The solubility of a sparingly soluble salt decreases as the pH is lowered. ()
8. The effect of common ion is to suppress the ionization of a weak acid or a weak base. ()
9. A strong acid has a large pK_a value. ()
10. The lower the pH, the more basic the solution; the higher the pH, the more acidic the solution. ()

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Best Wishes

Prof. Dr. Ali Ahmed Abdel-Hafez & Dr. Mohamed Abdel megeed



Faculty of Science
Subject: English Language 1
First Semester Exam



Answer the Following Questions.

I- Translation

(2.5 x 3 points)

1. لا يمكنني الدخول إلى البريد الإلكتروني .
A. Enter B. Access C. Arrive
2. يجب أن يلتزم جميع المواطنين بأحكام الدستور والقوانين والأنظمة الداخلية.
A. Regulation B. Constitution. C. Institution
3. استطاع الموظفون تحت قيادة المدير الحكيمة أن يحققوا أرباحاً مرتفعة.
A. Guidance. B. Leadership C. Flagship

II- Essay Writing

(2.5 x 3 points)

4. There are no effective boundaries when it comes to pollutants. Studies have shown that toxic insecticides that have been banned in many countries are riding the wind from countries where they remain legal. Compounds such as DDT and toxaphene have been found in remote places like the Yukon and other Arctic regions.

What's the best topic sentence for this paragraph?

- A. Toxic insecticides such as DDT have not been banned throughout the world.
- B. Even a worldwide ban on toxic insecticides would not stop the spread of DDT pollution.
- C. DDT and toxaphene are the two most toxic insecticides in the world.

5. _____ . First of all, we need money to repair old roads and build new roads. We also need more to pay teachers' salaries and to pay for services such as trash collection. Finally, more tax money is needed to give financial help to the poor citizens of the city. It is clear that the city will have serious problems if taxes are not raised soon.

What's the best topic sentence for this paragraph?

- A. We should raise city taxes.
- B. City taxes are too high.
- C. City taxes pay for new roads.

6. If a car suddenly begins to skid on ice, a driver's instinctive reaction might be the wrong one.

Choose the sentence that best supports or develops this topic sentence.

- A. Skids can be a terrifying experience.
- B. Cars can be very unpredictable on ice.
- C. Many people instinctively turn the wheel in the wrong direction, making the skid worse.

III- Structure and written expressions.

(2.5 x 10 points)

7. Economics my field of study.
A. is B. are
8. From your words, I can that you think he is guilty.
A. infer B. imply
9. The book is on the table over
A. there B. their
10. Although the professor did not send them the quizzes. This is a/an
A. complex sentence B. simple sentence C. dependent clause
11. You can come with me now or you can walk home. This is a/an
A. simple sentence B. complex sentence C. compound sentence
12. In 1988, Joe King, an engineering professor from California, made a 23-foot exact replica of the Eiffel Tower from 110,000 toothpicks. This is a/an
A. simple sentence B. dependent clause C. complex sentence

13. Which sentence is correctly punctuated?

- A. Laila said, "meet me at 10.00 sharp."
- B. Laila said: "meet me at 10.00 sharp."
- C. Laila said, "meet me at 10:00 sharp."

14. Choose the parallel sentence:

- A. His famous adventures included unearthing an ancient Greek shipwreck and photography of Antarctica's underwater ice sculptures.
- B. His famous adventures included unearthing an ancient Greek shipwreck and photographing Antarctica's underwater ice sculptures.
- C. His famous adventures included unearthing an ancient Greek shipwreck and photographed Antarctica's underwater ice sculptures.

15. The Saints and Strangers argued about how they would live in the New World. After much discussion, they came together and signed the Mayflower Compact.

The Compact was _____.

- A. a container for makeup
- B. a small item
- C. an agreement

16. Most of America's Founding Fathers did not believe in women's suffrage. Only men could vote in the United States until 1920.

What is "suffrage"?

- A. something that causes physical pain
- B. skirts that did not cover ankles
- C. the right to vote

IV- Reading Comprehension.

(2.5 x 4points)

Read the following passage and answer the questions below:

Coca-Cola was invented in 1886 by Atlanta pharmacist John S. Pemberton. The name for the product was actually proposed by Pemberton's assistant, Frank Robinson. The name was taken from the two most unusual ingredients in the drink, the South American Coca leaf and the African cola nut.

The **recipe** for today's Coca-Cola is very well guarded. Many of the ingredients are known, in addition to coca leaves and cola nut, they include lemon, orange, lime, cinnamon, nutmeg, caramel, and sugar. The proportions of the ingredients and the identity of Coke's secret ingredients are known by only a few of the Coca-Cola Company's senior corporate officers.

Choose the correct answer:

17. The passage mainly discusses _____.

- A. the success of the Coca-Cola Company
- B. the unusual ingredients in Coca-Cola
- C. John S. Pemberton.
- D. Coca-Cola's recipe and who developed it

18. According to the passage, who created Coca-Cola?

- A. The CoCa-Cola Company
- B. John S. Pemberton
- C. Pemberton's assistant
- D. Frank Robinson

19. A "recipe" in line 5 is _____.

- A. information about drugs for a pharmacy
- B. a description of how to prepare something
- C. an accounting statement
- D. a corporate organizational plan

20. The passage states that the recipe for Coca-Cola is

- A. well known.
- B. known by only a limited number of people
- C. unknown
- D. published information

Good Luck

Main examiner: Dr. Marwa M. Abdelmotaleb

Final examination in Organic chemistry 211C for non chemistry students (the chemistry of aliphatic compounds and some selected aromatic compounds)

Answer the following -----

Section I

Choose the correct answer of A,B,C or D -----25 marks

- 1-Reduction of acrylic acid using LiAlH_4 /ether yields
a-allyl alcohol b-ethyl alcohol c-vinyl alcohol d-isoamyl alcohol
- 2-Reaction of 1,3-butadiene with propene/benzene affords
a-4-formylcyclohexene b-4-methylcyclohexene c-cyclohexene d-4-ethyl cyclohexene
- 3-Reaction of CH_3CHO and $\text{CH}_2\text{O}/\text{NaOH}$ to form acrolein the reaction name is
a Aldol b-Diels-alder c-Zielger d-Williamson reaction
- 4-Oxidation of acrolein using silver oxide yields
a-Fumaric acid b-maleic acid c-acrylic acid d-crotonic acid
- 5-Hydrolysis of vinylcyanide using HCl /heat affords
a-isocrotonic acid b-acrylic acid c-pent-3-enoic acid d-crotonic acid
- 6-Reaction of butadiene with NH_3 gives
a-Pyrrol b-thiophene c-furan d-pyridine
- 7-Oxidation of cyclohexanone by HNO_3 affords
a-malonic acid b-adipic acid c-glutaric acid d-pimelic acid
- 8-Reaction of the sodium salt of EAA with $\text{ClCH}_2\text{CO}_2\text{Et}$ followed by acid hydrolysis gives
a-Pentandioic acid b-butandioic acid c-pentanoic acid d-butanoic acid
- 9-Chlorination of propane with Cl_2 /light, the reaction classified as
a-nucleophilic addition reaction b-electrophilic addition reaction c-free radical addition reaction d-free radical substitution reaction
- 10-Heating of ethyl bromide with alc.KOH to give ethene, the reaction proceeds via
a- SN^1 b- SN^2 c- E^1 d- E^2 mechanism
- 11-The most reactive of the following alkyl halides towards $\text{SN}2$ reaction conditions is
a- $\text{CH}_3\text{CH}_2\text{Br}$ b- CH_3Br c- $\text{CH}_3\text{CH}_2\text{CH}_2\text{Br}$ d- $\text{CH}_3\text{CH}(\text{Br})\text{CH}_3$
- 12-Bromination of 1-butene with NBS/ROOR affords
a-3-bromo-1-butene b-4-bromo-1-butene c-1,2-dibromobutane d-3,4-dibromo-1-butene
- 13-Acid hydrolysis of ethyl acetoacetate (EAA) yields
a-acetic acid b-propanoic acid c-butanoic acid d-crotonic acid
- 14-Heating of t-butyl bromide with alc.KOH, the major product is
a-2-methyl-1-propene b-t-butanol c-2-butene d-2-ethoxy,2-methylpropane
- 15-The most polar solvent of the following in $\text{SN}1$ reaction is
a-DMF b-DMSO c- H_2O d- CH_3COCH_3
- 16-Reaction of benzene with $\text{CH}_3\text{COCl}/\text{AlCl}_3$ yields
a- PhCOCH_3 b- PhCH_3 c- $\text{PhCOCH}_2\text{CH}_3$ d- PhCOCH_2Cl
- 17-the best choice of reagents to effect the iodination of benzene is
a- $\text{KI}/\text{acetone}$ b- $\text{I}_2/\text{CH}_3\text{CN}$ c- ICl/AlCl_3 d- KI/HNO_3
- 18- NH_2 group in electrophilic aromatic substitution reaction classified as
a-strongly activating b-moderately activating c-weakactivating d-weakdeactivating
- 19-Hydrolysis of benzenesulfonic with HCl yields
a-phenol b-benzene c-diphenylsulfone d-diphenylsulfoxide
- 20-The most basic of the following compounds is
a-methylamine b-aniline c-p-nitroaniline d-4-methylaniline

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- 21-Reduction of m-dinitrobenzene with sodium sulfide yields
 a-o-nitroaniline b-m-nitroaniline c-m-diaminobenzene d-aniline
 22-Reaction of toluene with $3\text{Cl}_2/\text{light(exss)}$ affords
 a-benzyl chloride b-benzal chloride c-benzotrichloride d-o and p chlorotoluene
 23-The best reducing agent to convert PhCOCH_3 to PhCH_2CH_3 is
 a-Zn(Hg)/HCl b- H_2/Ni c-Liq. NH_3 d- $\text{LiAlH}_4/\text{ether}$
 24-Oxidation of toluene using KMnO_4 yields
 a- PhCH_2COOH b- PhCOOH c- PhCHO d- PhCH_2CHO
 25-Reaction of benzenediazonium chloride with KI gives
 a- PhCN b- PhCl c- PhI d- PhBr

Choose(T) for true sentence or(F) for false sentence-----25marks

- 26-Ethyl chloride on reaction with EtONa/EtOH yields diethyl ether
 27-Heating of 1,4-dichloro butane with sodalime gives 1,3-butadiene
 28-Reaction of Br_2 with 1,3-butadiene yields only 1,2-dibromo-1-butene
 29-Heating of 2,3-dibromopropanoic acid with Zn/EtOH affords crotonic acid
 30-Methyl vinylketone undergoes Diels-Alder reaction
 31-HCl adds to acrylic acid to form 2-chloropropanoic acid
 32-Ozonolysis of 1,5-hexadiene(diallyl) yields butandial
 33-heating of calcium adipate affords cyclohexanone
 34-Heating of bromosuccinic acid with alkali gives fumaric acid as major product
 35-EAA on treatment with ferric chloride yields reddish-violet colour
 36-Ketonic hydrolysis of EAA affords 2-pentanone
 37- PhNHNH_2 reacts with EAA to form pyrazoline compounds
 38-Fumaric acid easily forms anhydride on heating at lower temperature
 39-Acetic acid classified as polar protic solvent
 40-Tert.butyl chloride on reaction with water yields tert.butanol as major product
 41-Nitrobenzene can undergo Friedel-Crafts reaction
 42-Chlorobenzene forms phenol upon heating with NaOH at lower temperature
 43- COOH group classified as weak deactivating group
 44-Bromobenzene on reaction with $\text{Br}_2/\text{FeBr}_3$ yields m-dibromobenzene
 45-Acetanilide on hydrolysis using HCl gives aniline
 46-Toluene is less reactive than benzene in electrophilic aromatic substitution reactions
 47-Benzenediazonium chloride on heating with water affords phenol
 48-N,N-dimethylaniline on reaction with HNO_2 yields p-nitroso-N,N-dimethylaniline
 49-N-methylaniline classified as primary amine
 50- OCH_3 considered as ortho-para director group

Section II ORAL

Choose(T) for true sentence or (F) for the false sentence----- 10 marks

- 51- PhCOCH_3 undergoes Friedel-Crafts reactions
 52-Benzene reacts with n-propyl chloride/ AlCl_3 to give only n-propylbenzene
 53-Aniline on reaction with $\text{HNO}_3/\text{H}_2\text{SO}_4$ affords m-nitroaniline
 54-The iodide anion is better leaving group than the chloride anion
 55-Heating of 2-chloropentane with alc. KOH yields 1-pentene as major product
 56-Bromine reacts with cyclopentene to form 1,2-dibromocyclopentane
 57-1-butene reacts with HBr/ROOR to give 2-bromobutane
 58- CH_3CHO reacts with CH_3MgBr followed by HCl workup yields ethanol
 59-Acid hydrolysis of $\text{CH}_3\text{COCH}(\text{CH}_3)\text{COOEt}$ affords butanoic acid
 60-Benzenediazonium chloride on reaction with H_2PO_2 yields benzene

GOOD luck

Prof.Dr.Sh.M.Radwan

Physical Chemistry Examination (C-230) for Second Level Students

Answer the following questions:

Section I

1) Answer Only Three from the following: (16 Marks)

- Derive the kinetic equation to determine the rate constant and the half-life period for the following reaction: $3A \xrightarrow{K_3} \text{products}$
- Discuss the effect of temperature on the reaction velocity.
- Discuss the theory of absolute reaction rates.
- At 378.5°C the half-life period for the first order thermal decomposition of ethylene oxide is 363 min., and the energy of activation of the reaction is 52000 cal/mol. From the data, estimate the time required for ethylene oxide to be 75% decomposed at 450 °C.
($R=1.978$ cal/degree/ mol.)

Section II

1- Answer the following: (24 Marks)

- Discuss the temperature dependence of entropy.
- The density of ice at 0°C is 0.9 g cm⁻³ and has entropy of 38 cal mol⁻¹ deg⁻¹. The density of liquid water at this temperature is 1 g cm⁻³ and has entropy of 60 cal mol⁻¹ deg⁻¹. Given this data, calculate ΔS , ΔH and ΔE for the conversion of 36 gm of liquid water to ice at the normal melting point. (M.wt. of H₂O=18 g mole⁻¹).
- Calculate the enthalpy change when 540 g of water freezes at constant pressure and a temperature of -30°C. At 0°C, ΔH is -1435 cal mole⁻¹, and C_p is 18 and 8.8 cal mol⁻¹ deg⁻¹ for water and ice, respectively.
- Find the cell potential for cell whose reaction equations of the two halves are:
$$\text{Ni}^{2+} + 2e \longrightarrow \text{Ni} \quad E^\circ = -0.25$$
$$\text{Sn} \longrightarrow \text{Sn}^{2+} + 2e \quad E^\circ = +0.14$$
and the concentrations are $\text{Ni}^{2+} = 1.3 \times 10^{-1}$ and $\text{Sn}^{2+} = 1.0 \times 10^{-5}$ mol/L.
Is the reaction spontaneous as written?

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2-Choose the correct answer:

(10 Marks)

I) The temperature of the system decreases in an:

- A) Adiabatic compression B) isothermal compression
C) Isothermal expansion D) Adiabatic expansion

II) The process, in which no heat enters or leaves the system, is

- A) Isochoric B) Isobaric C) Isothermal D) Adiabatic

III) A thermodynamic state function is:

- A) One which obeys the laws of thermodynamics.
B) A quantity which is used in measuring thermal changes.
C) One which is used in thermo chemistry.
D) A quantity depends only on the initial and final national of the system.

IV) In thermodynamics, a process is called reversible when:

- A) Surroundings and system change into each other.
B) There is no boundary between system and surroundings.
C) The surroundings are always in equilibrium with system.
D) The system changes into the surroundings spontaneously.

V) A mixture of 2 moles of CO and 1 mole of O₂, in a closed vessel is ignited to CO₂. If ΔH is the enthalpy change and ΔE is the change in internal energy, then :

- A) $\Delta H < \Delta E$, B) $\Delta H > \Delta E$ C) $\Delta H = \Delta E$
D) The relationship depends on the capacity of the vessel.

VI) Identify the correct statement regarding a spontaneous process:

- A) Exothermic process is always spontaneous.
B) Lowering of energy in the reaction is only criterion for spontaneity
C) For a spontaneous process in an isolated system, the change in entropy is positive.
D) Endothermic process is never spontaneous.

VII) The latent heat of vaporization of a liquid at 500K and 1atm. pressure is 10 kcal/mol. What will be ΔE of 3 moles of liquid at 500 K:

- A) 13kcal B) -13kcal C) 27 kcal D) - 27 kcal

VIII) Reaction, $\text{H}_2 + \text{I}_2 \leftrightarrow 2\text{HI}$, $\Delta H = 12.4 \text{ kcal}$ according to this, heat of formation of HI will be:

- A) 12.4 kcal B) -12.4 kcal C) -6.2 kcal D) 6.2 kcal

IX) ΔG° for the reaction $\text{X} + \text{Y} \leftrightarrow \text{Z}$ is -4.606 kcal, the value of equilibrium constant at 227°C is ($R = 2 \text{ cal mol}^{-1} \text{K}^{-1}$):

- A) 100 B) 10 C) 2 D) 0.01

X) Considering entropy as thermodynamic parameter the criterion for spontaneity of any process is:

- A) $\Delta S_{\text{system}} + \Delta S_{\text{surrounding}} > 0$ B) $\Delta S_{\text{system}} - \Delta S_{\text{surrounding}} > 0$
C) $\Delta S_{\text{system}} > 0$ only D) $\Delta S_{\text{surrounding}} > 0$ only

Questions for oral estimation

Answer the following:

(10 Marks)

a) Complete the following equation to show the relation between temperature and the rate constant

$\text{Log } K_1/K_2 = \dots\dots\dots$

b) At 760 mm/Hg, 100gm of benzene is vaporized at its boiling point of 80°C . Calculate: a) W_{rev} , b) q , c) ΔH , d) ΔE , (the heat of vaporization is 7.6 Kcal / mol, M.wt of benzene = 78 gm/mol.)

Examiners: Prof.Dr.Y.Temerk ; Prof.Dr.A.El-Awad



Final exam in Organic chemistry(I) course for second level's industrial chemistry students

Part 1 (Reaction Mechanism): (25 marks)

Answer the following questions:

1. A. Choose the correct answer for the following questions: (15 marks)

- Which of the following is electrophile:
i. FeCl_3 ii. $\text{C}_2\text{H}_5\text{OH}$ iii. H_2O
- Which of the following is polar protic solvent:
i. CH_3OH ii. CH_3COCH_3 iii. C_6H_{14}
- Which is true about carbocation:
i. SP^3 hybridized ii. Nucleophile iii. Has 6-electrons
- Bromination of 1,3-butadiene mainly give:
1, 2-dibromo-1-butene ii. 1,4-dibromo-2-butene iii. 3-bromo-butene
- Reaction of toluene ($\text{C}_6\text{H}_5\text{CH}_3$) with bromine in the presence of sun light to give benzyl bromide ($\text{C}_6\text{H}_5\text{CH}_2\text{Br}$) was considered:
i. electrophilic substitution reaction ii. Nucleophilic substitution reaction
iii. Free radical substitution reaction.
- Reaction of benzene (C_6H_6) with bromine in the presence of AlBr_3 to give bromobenzene was considered:
i. electrophilic substitution reaction ii. Nucleophilic substitution reaction
iii. Free radical substitution reaction.
- Which is wrong about the $\text{S}_{\text{N}}1$ Mechanism:
i. multistep reaction ii. Unimolecular reaction iii. Has one transition state
- Which of the following is the most acidic carboxylic acid:
i. $\text{BrCH}_2\text{CH}_2\text{COOH}$ ii. $\text{ClCH}_2\text{CH}_2\text{COOH}$ iii. $\text{FCH}_2\text{CH}_2\text{COOH}$
- The reaction of acetone with HCN to give acetone cyanohydrine ($\text{CH}_3\text{C}(\text{OH})(\text{CN})\text{CH}_3$) was considered:
i. electrophilic addition reaction ii. Nucleophilic addition reaction
iii. Free radical addition reaction
- Which of the following free radicals is the less stable:
i. $\cdot\text{CH}_3$ ii. $\text{H}_3\text{C}\cdot\text{CHCH}_3$ iii. $\cdot\text{C}(\text{CH}_3)_3$
- While vinyl alcohol is not stable it can't be isolated which converted into:
i. Acetone ii. Acetaldehyde iii. Ethyl alcohol
- Which of the following compound is classified as allylic halide:
i. $\text{PhCH}=\text{CBrCH}_3$, ii. $\text{PhCH}=\text{CH}-\text{CH}_2\text{Br}$, c. $\text{PhCBr}=\text{CHCH}_3$
- Tertiary butyl carbocation was stabilized through:
i. hyperconjugation ii, inductive effect iii. Resonance effect,
- Which is correct about carboanion:
i. SP^2 hybridization ii. Is considered electrophile iii. Is considered nucleophile
- Methyl bromide reacts with $\text{CH}_3\text{CH}_2\text{ONa}$ / $\text{CH}_3\text{CH}_2\text{OH}$ via :
i- $\text{S}_{\text{N}}1$ mechanism , ii- $\text{E}1$ mechanism , ii- $\text{S}_{\text{N}}2$ mechanism

Question 2: Put (✓) in the front of correct statement and (X) in the front of wrong statement:
.....(10 marks)

- Free radical carbon was considered as nucleophile.
- Acetone was considered as aprotic solvent.
- The rate of $\text{S}_{\text{N}}2$ reaction mechanism doesn't affected with nucleophile (attacking group)
- $\text{S}_{\text{N}}1$ mechanism reaction prefer good nucleofug.
- Hemolysis of bonds usually occurred in low temperature.
- $\text{S}_{\text{N}}2$ reaction Mechanism has two transition state.
- Hydrolysis of vinyl chloride usually form acetaldehyde.
- Acetaldehyde condensed in the presence of sodium hydroxide to form 2-butenal.
- Crotonaldehyde can be presented in two forms cis and trans.
- Formic acid more acidic than acetic acid.

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Question corresponding to oral Exam:.....(5 marks)

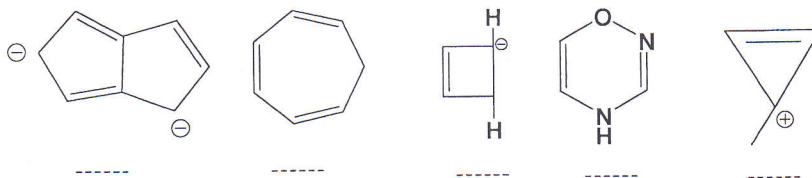
Put (✓) in the front of correct statement and (X) in the front of wrong statement:

1. Alkenes reactions mostly electrophilic addition reactions.
2. E1cB reaction mechanism kinetically 2nd order reaction.
3. Nitration of benzene was considered as nucleophilic substitution reaction.
4. Trichloroacetic acid (CCl₃COOH) is more acidic than trifluoroacetic acid(CF₃COOH).
5. Carbon tetrachloride (CCl₄) was considered polar solvent.

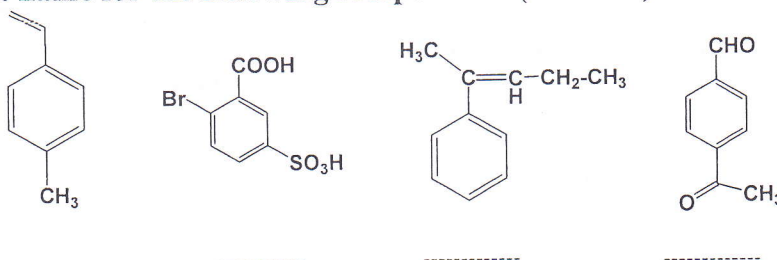
Part II. Aromatic Section: (25 Marks)

Answer the following questions

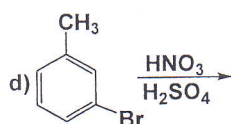
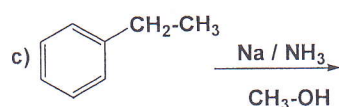
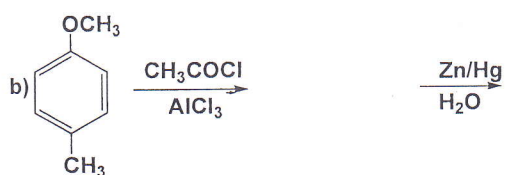
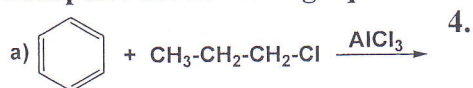
1. Describe the following as aromatic, anti-aromatic or non-aromatic (2.5 Marks)



2. What is the correct name for the following compounds? (4 Marks)



3. Complete the following equations: (4.5 Marks)



Choice the correct answer from the following questions (14 Marks)

4. Which of (a)-(d) does not give isopropyl benzene as a product upon reaction with benzene?
- a) (CH₃)₂CHCl/AlCl₃
 - b) CH₃CH₂CH₂Cl/AlCl₃
 - c) CH₃CH=CH₂/H₃PO₄
 - d) (CH₃)₂C=CH₂/H₃PO₄

5. The Huckel's $4n+2$ rule on aromaticity is applicable to
 - a) All hydrocarbons
 - b) All aromatic hydrocarbons
 - c) All aromatic compounds
 - d) Only naturally occurring aromatic compounds
6. When benzene undergoes its typical reactions it behaves as
 - a) An electron donor
 - b) An electron acceptor
 - c) An electrophile
 - d) None of the above is correct
7. When considering electrophilic aromatic substitution reactions electron donating substituents (e.g. methoxy) are described as:
 - a) *Ortho/para* directing and activating
 - b) *Ortho/para* directing and deactivating
 - c) *Meta* directing and activating
 - d) *Meta* directing and deactivating
8. The reaction of benzene with MeCl under Friedel-Crafts conditions leads to which of the following
 - a) A mixture of methylbenzene, 1,2-dimethylbenzene and 1,4-dimethylbenzene.
 - b) 1,2-Dimethylbenzene and 1,4-dimethylbenzene as the only products.
 - c) Methylbenzene (toluene) as the only product.
 - d) Methylbenzene and 1,2-dimethylbenzene as the only products.
9. Find the reactants other than AlCl_3 in Friedel-Craft's alkylation
 - a) $\text{C}_6\text{H}_6 + \text{CH}_4$
 - b) $\text{C}_6\text{H}_6 + \text{NH}_3$
 - c) $\text{C}_6\text{H}_6 + \text{CH}_3\text{Cl}$
 - d) $\text{C}_6\text{H}_6 + \text{CH}_3\text{COCl}$
10. What is the electrophile in the electrophilic substitution reaction of benzene using oleum and conc. H_2SO_4 ?
 - a) SO_3H
 - b) NO_3
 - c) NO_2^+
 - d) NO^+
11. Which of the following is the most activating in electrophilic aromatic substitution?
 - a) $-\text{NO}_2$
 - b) $-\text{NHCOCH}_3$
 - c) $-\text{CN}$
 - d) $-\text{NH}_2$
12. Which of the following statements regarding electrophilic aromatic substitution is wrong?
 - a) Acetyl and cyano substituents are both deactivating and *m*-directing
 - b) Alkyl groups are activating and *o,p*-directing
 - c) Nitro group are *m*-directing but amino groups are *o,p*-directing
 - d) Chloro and methoxy substituents are both deactivating and *o,p*-directing

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13. Which combination of reagents used in the indicated order with benzene will give *m*-nitropropylbenzene?

- 1) $\text{HNO}_3/\text{H}_2\text{SO}_4$, 2) $\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}/\text{AlCl}_3$
- 1) $\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}/\text{AlCl}_3$, 2) $\text{HNO}_3/\text{H}_2\text{SO}_4$
- 1) $\text{CH}_3\text{CH}_2\text{COCl}/\text{AlCl}_3$, 2) $\text{HNO}_3/\text{H}_2\text{SO}_4$, 3) $\text{H}_2\text{NNH}_2/\text{NaOH}$
- 1) $\text{HNO}_3/\text{H}_2\text{SO}_4$, 2) $\text{CH}_3\text{CH}_2\text{COCl}/\text{AlCl}_3$, 3) $\text{H}_2\text{NNH}_2/\text{NaOH}$

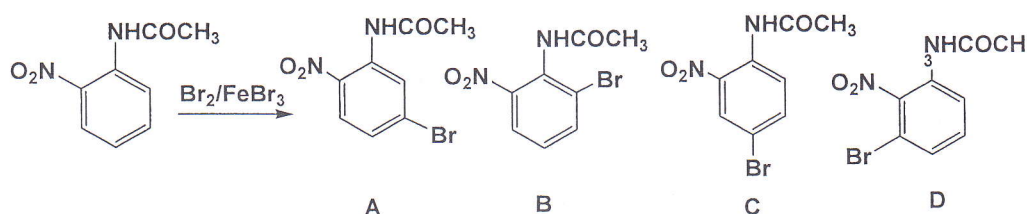
14. Which of the following statements regarding electrophilic aromatic substitution is wrong?

- Sulfonation of toluene is reversible
- Friedel-Crafts alkylation of benzene can be reversible
- Friedel-Crafts alkylation with primary alkyl chloride may involve rearrangement.
- Friedel-Crafts acylation of ethylbenzene readily gives a *meta* substitution product.

15. Aromatic systems contain $4n+2$ π -electrons where n is

- The number of carbon atoms in the ring,
- The number of lone pairs of electrons in the molecule
- An integer excluding zero
- An integer.

16. Which is the most likely major product in the following react

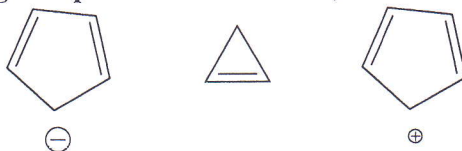


Oral Examination (5 Marks)

1. Which of the following is not associated with electrophilic aromatic substitution?

- The formation of nitrobenzene
- The formation of benzyne
- The formation of bromobenzene
- The formation of benzene sulfonic acid

2. Which of the following compounds is aromatic, antiaromatic and nonaromatic



3. Match the substituent to the stated orientation and activation effects. Which set is incorrect?

- Cl ; activating; *o*- and *p*-directing.
- NO_2 ; deactivating; *m*-directing.
- OH ; activating; *o*- and *p*-directing.
- Me ; activating; *o*- and *p*-directing.

Answer the following Questions:

- 1) a) Which are these polymers are: Natural , Synthetic , or Both:
Meat, Fiberglass, Silk, PVC, Hair, Leather , DNA&, Dacron, Rubber, Cement, Clothes, Paints, Foams, Cellulose, Potatoes, Toys .
b) What is the HIPS ? draw its structure?
- 2) a) Which of these polymers are: branched, linear or crosslinked: Polyethylene, Polypropylene , Polyisoprene , Polyester, Polystyrene , Polybutadiene , Nylon.
b) Three things that make polymers are different. Discuss?
- 3) a) " Carbon Fibers..... the wonder polymer..... stronger than the steel". Show by equations the steps of production of this polymer.
b) What is the difference between Cellulose and Starch according to its Monomers?
- 4) Show by equations how can you prepare the following polymers:
i) Polyethyleneterephthalate. ii) Nylon 6,6 iii) Polystyrene
- 5) a) In the free radical vinyl polymerization, discuss by equations the steps of polymerization ?
b) What are the type of Initiators , give an example for each one ?
- 6) a) Explain by equations the Cationic Vinyl polymerization?
b) Mention and draw the types of Copolymers?

Good Luck

Examiner:

Prof. Dr. Kamal I Aly



Section I (Inorganic Chemistry)

(25 Marks)

Answer the following questions

1. -a) Explain the reasons for **Five only** from the following:
 - i The Unexpected high boiling point of H_2O .
 - ii NO_2 is an acidic Oxide.
 - iii. SF_6 is known but OF_6 is not.
 - iv. Concentrated solution of HF acid is not kept in glass bottle.
 - v. Cesium ions conduct electricity more than lithium ions..
 - vi. CO is a poisonous gas .
 - b) How you can prepare **three only** from the following:
superphosphate, water gas, NH_3 , HI
 - c) In each pairs of acids, state which is stronger and why?
 HF and HBr , HClO_2 and HIO_2 , H_2SO_4 and H_2SO_3 .
- 2 -a) Choose the correct answer and comment:
 - i) In which species does **nitrogen** exhibit its highest oxidation state
(NH_3 , NO_2^- , N_2) .
 - ii) Which one of the following species contains an **even** number of electrons: (NO_2 , NH_4^+ , NO)
 - iii) The species which contains **diamagnetic** properties is (NO , O_2 , N_2)
 - b) Give **three examples** of Freon's and how do they damage the environment
 - c) What the types of hardness of water ? How we can remove this problem?

See the Next Page



Section II Physical Chemistry

(Marks:25)

Answer the following questions

I) Choose the correct answer:

(Mark: 10)

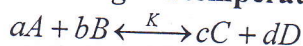
- 1) At constant P : $\Delta S^\# = ..$ a) $nC_V \ln \frac{T_2}{T_1}$, b) $nC_V \ln \frac{T_1}{T_2}$, c) $nC_P \ln \frac{T_2}{T_1}$, d) zero
- 2) If $\Delta H^\#$ is negative, thus, K is: a) decrease, b) increase, c) zero, with T
- 3) If $\Delta H^\#$ is positive, so $d \ln K$ is: a) negative, b) Positive, c) zero, d) ∞
- 4) If dT , is positive, thus, the reaction: a) endothermic, b) exothermic, c) 0.0
- 5) If $\Delta G^\#$ is a negative, corresponds to: a) lower K , b) large K , c) constant K
- 6) Under adiabatic expansion of an ideal gas: $\Delta Q =$ a) ΔW b) ΔE , c) Zero
- 7) For reversible process: $\Delta G^\# = ..$ a) Q_{rev} , b) Q_{irrev} c) Zero d) $> zero$
- 8) For irreversible process: $\Delta G^\# =$ a) ΔQ , b) $\Delta H^\#$ c) < 0.00
- 9) $\ln K = \frac{.....}{.....} + \frac{.....}{.....}$, 10) $\frac{d(\ln K)}{dT} = \frac{-.....}{.....}$

II -a) Show, how can you calculate the work done (W) in each operation, maximum work (W_{max}), and efficiency (η) during Carnot cycle

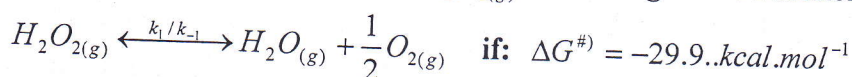
II-b) Show that under adiabatic conditions for the expansion of an ideal gas: $PV^\gamma = \text{Constant}$

(Mark: 6)

III-a) Prove that the equilibrium constant (K) for the chemical reaction is affected by the change in temperature (T):



III-b) for decomposition of gaseous $H_2O_{2(g)}$ according to the reaction:



Calculate of K of this reaction at: $T = 300, 350, \text{ and } 400.K$

(Mark: 6)

IV) The K for the reaction: $2NO_{2(g)} \xrightleftharpoons{K} N_2O_{4(g)}$ is:

$K_1 = 8.5$, at $T = 320.K$, $\Delta H^\# = -13.75 \text{ kcal/mol}$, and $R = 1.98 \text{ cal/mol-deg}$

Calculate: (i) K_2 , at $T = 273.K$,

(ii) $\Delta G^\#$, (iii) $\Delta S^\#$ at $T = 310.K$

(Mark: 3)

Good Luck

Section III: Oral Question: (A)

(Mark: 5)

Are the following statements True (✓) or False (X).

1. Boron forms three covalent bond using sp^3 hybrid orbitals. ()
2. Tritium has one proton and two neutrons. ()
3. H_3PO_3 used as reducing agent. ()
4. Insoluble carbonates are converted to soluble carbonate by heating. ()
5. The oxides of gr(I) elements are strong acids. ()

Section III: Oral Question: (B)

(Mark: 5)

- 6) $C_p = C_v + \dots$
- 7) $\Delta G^\# = \Delta G^{\#0} + \dots$
- 8) $\Delta E = q - \dots$ a) X b) W c) H
- 9) At constant V, $\Delta E = \dots$ a) q_v b) q_p c) q_w
- 10) $\Delta H = \dots$ a) q_v b) q_p C) q_F

Good Luck

Examiners: Prof. Dr. Amna S A Zidan,

Prof. Dr. Seddique M Ahmed



**Final Examination of Introductory Quantitative Analysis
For 2nd Level Students "Credit Hours System"**

Section I

Answer the following questions:

(50 Marks)

I – Write (True) or (False) in front of the following statements:

(30 Marks)

- 1) Accuracy is defined as the closeness of the measured value to the true value. ()
- 2) Significant figure is the minimum number of digits needed to write a given value in scientific notation without loss of accuracy. ()
- 3) F- test tells us whether to a standard deviation are significantly different from each other. ()
- 4) Ionic strength is a measure of the total concentration of ions in solution. ()
- 5) H_2PO_4^- and HPO_4^{2-} are a conjugate acid base pair. ()
- 6) Lewis acid is a substance that donates protons. ()
- 7) Buffer solutions resist the change in pH upon adding strong acid or strong base. ()
- 8) Autoproteolysis is the self- ionization of a solvent to give a cation and anion. ()
- 9) Equivalent point is the point which the reaction is observed to be completed. ()
- 10) Co- precipitation is the impurities collected on the product while a precipitate is standing in the mother liquor. ()
- 11) Electrode potential is the measure of the tendency of a half reaction to gain or loss protons. ()
- 12) In Volhard method, chlorides are first precipitated with excess of silver nitrate, then excess silver is titrated with potassium thiocyanate. ()
- 13) The highest reduction potential, then reduction will occur, and oxidation of the other half reaction will be performed. ()
- 14) Mohr method should be performed in acidic medium ($\text{pH} < 4$). ()
- 15) A redox indicator is a compound that changes color when it goes from oxidized form to reduced form. ()
- 16) EDTA in the form of H_4Y is soluble in water. ()

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- 17) Methyl orange and phenol phthalein are good examples of adsorption indicators ()
- 18) Complexometric titration curve is the plot of pM versus the volume added of ligand ()
- 19) The net chemical reaction of redox titrations should not include number of electrons ()
- 20) The end point of turbidimetric method is detected by the appearance of permanent turbidity. ()

II – Choose the correct answer:

(20 Marks)

- 21) The titer is the number of analyte that reacts with 1.0 mL titration.
 a) μg b) mg
 c) Kg d) ng
- 22) The number 0.0670 has significant figures.
 a) 2.0 b) 3.0
 c) 4.0 d) 5.0
- 23) For the following set of analytical results 15.67 g , 15.69 g and 16.03 g, the standard deviation is
 a) 0.2 b) 0.3
 c) 0.4 d) 0.5
- 24) A setoff three replicate analytical results have a mean of 93.50 and a standard deviation of 0.075. The confidence limit at (95 % CL, $t = 4.303$) is
 a) 93.50 ± 0.17 b) 93.50 ± 0.18
 c) 93.50 ± 0.19 d) $93. \pm 0.16$
- 25) A solution is 0.2 M in acetic acid ($\text{p}K_a = 4.76$) and 0.2 M in sodium acetate, the pH of this solution is
 a) 4.76 b) 5.76
 c) 3.76 d) 5.87
- 26) A diprotic acid H_2A ($\text{p}K_{a1} = 3.05$, $\text{p}K_{a2} = 4.50$), the principle form exists at pH 5.0 is
 a) H_2A b) HA^-
 c) A^{2-} d) non of these
- 27) In a titration of weak acid with strong base, the pH at the equivalent point is
 a) acidic b) neutral
 c) alkaline d) non of these

- 37) The concentration of free M^{2+} in a solution prepared by mixing equal volume of M^{2+} (0.2 M) and L (0.2 M), if the divalent metal, M^{2+} , reacts with a ligand, L, to form a 1:1 complex (ML^{2+}), and K_f is equal to 1×10^8 is
- (a) 3.2×10^{-5} M (b) 1.6×10^{-5} M
(c) 6.4×10^{-5} M (d) 3.2×10^5 M
- 38) The equilibrium constant for the following redox reactions: $Cl_2 + 2Fe^{+2} = 2Cl^- + 2Fe^{+3}$, $E^\circ_{Cl_2/Cl^-} = 1.36$ V, $E^\circ_{Fe^{+3}/Fe^{+2}} = 0.77$ V, is
- (a) 10^{30} (b) 10^{20}
(c) 10^{-20} (d) 10^{-30}
- 39) The balanced reduction half reaction equation of MnO_4^{-1}/Mn^{2+} in acidic medium is
- (a) $MnO_4^{-1} - 8H^+ + 5e^- = Mn^{2+} - 7H_2O$ (b) $MnO_4^{-1} + 8H^+ + 5e^- = Mn^{2+} + 4H_2O$
(c) $MnO_4^{-1} - 8H^+ + 5e^- = Mn^{2+} + 4H_2O$ (d) $MnO_4^{-1} + 8H^+ + 5e^- = Mn^{2+} - 4H_2O$
- 40) The oxidation number of manganese (Mn) in MnO_2 is
- (a) +2 (b) -4
(c) -2 (d) +4

Section II

Oral Question

(10 Marks)

السؤال الشفوي إجباري

I- Write (True) or (False) in front of the following statements:

- 41) The systematic error or indeterminate error arises from the effects of uncontrolled variables in the measurement. ()
- 42) The pK_{in} of the indicator should be close to the pH of the equivalence point. ()
- 43) Molality is the number of moles of solute per liter of solvent or solution. ()
- 44) The potential of the half reaction of a solution consisting of $Cr_2O_7^{-2}$ (10^{-3} M) and Cr^{+3} (10^{-2} M) is 1.065 if the pH of the solution is 2.0, and $E^\circ = 1.33$ V. ()
- 45) The ppm is the number of grams of solute per liter of solvent or solution. ()

Good Luck

Examiners:

Prof. Dr. Elham Y. Hashem

Dr. Ahmad Als Markab

Final Exam for second level Students, Applied Industrial Chemistry Program
Electrochemistry (C209), 1st semester

($F=96485 \text{ C mol}^{-1}$, $R=8.314 \text{ J K}^{-1} \text{ mol}^{-1}$, At. Mass Cu=63.55)

Part I

Answer (T) for true sentences or (F) for false sentences for the following (one mark for each)

- 1- It is impossible to measure the potential of a single electrode.
- 2- The battery works as the energy released by a non-spontaneous reaction is converted to electricity.
- 3- Free elements (uncombined state) have an oxidation state of zero.
- 4- The oxidation-reduction is the basic chemical reaction of the electrochemical cell.
- 5- From the electrochemical reduction potential series, the more electrode positive is the more anodic behavior.
- 6-changing the stoichiometric coefficients of the electrode reaction change the value of E° .
- 7- The potential of the metal amalgam electrode is sensitive to the mercury ion in the electrolyte.
- 8-The concentration cell is Two half cells with identical electrodes but different ion concentrations.
- 9-Electrolysis is the process in which electrical energy is used to cause a spontaneous chemical reaction to occur.
- 10- Electrolysis of sodium chloride molten salt to produce sodium metal at cathode and oxygen gas at anode.
- 11- The oxidation state of oxygen in hydrogen peroxide is -1.
- 12-The amount of substance changed during electrochemical reaction is proportional to the amount of voltage applied.
- 13-A battery is a series of combined galvanic cells, that can be used as a source of direct electric current at a constant voltage.
- 14- The electrolyte solution of the mercury battery containing KOH and paste of Zn(OH)_2 and HgO .
- 15- The lead storage batter is irreversible cell.
- 16- A fuel cell is an electrochemical cell that requires a continuous supply of reactants to keep functioning.
- 18-Electrolyte is an ionic conductor where it conducts the electricity through the mobility of the ion.
- 19- Hydration is the process in which an ion is surrounded by oxygen molecules arranged in a specific manner.
- 20- Activity is the effective concentration of ions depending on inter-ionic interactions in solution.
- 21- Activity coefficients (γ) close to zero for dilute solutions.
- 22- According to Debye-Huckel law: electrostatic interactions between ions are ignored.
- 23- According to Debye-Huckel law: The ions are considered to be point charges (no size).
- 24- According to Debye-Huckel law: The effect of solvation and the structure of the solvent is considered.
- 25- In a solid crystal containing a large anion and a small cation, the small cations move in different sites.

Part II

Choose the correct answer For the following (one mark for each)

- 1- The oxidation state of Cr in $\text{K}_2\text{Cr}_2\text{O}_7$ is
a) 2 b) 4 c) 5 d) 6
- 2- After balancing the following redox reaction, the sum of all coefficients of the products will be

- $\text{Cr}_2\text{O}_7^{2-}(\text{s}) + \text{Fe}^{+2} \rightarrow \text{Cr}^{3+} + \text{Fe}^{3+}(\text{g})$ (acidic solution)
- a) 15 b) 8 c) 21 d) 12
- 3-Suppose the above reaction occurs in basic solution, the sum of all coefficients of the reactants will be:
- a) 15 b) 36 c) 22 d) 14
- 4- The E° of a cell for the following reaction is 0.34 V, what is the equilibrium constant:
- $$2\text{Cr}(\text{s}) + 3\text{Cd}^{2+}(1\text{ M}) = 3\text{Cd}(\text{s}) + 2\text{Cr}^{3+}(1\text{ M})$$
- a) 3×10^{34} b) 79.4 c) 3×10^{10} d) 100
- 5-, its reaction does not occur naturally, requires external energy to occur.
- a) Galvanic cells b) Reversible cells c) Rechargeable cells d) Electrolytic cells
- 6-Standard reduction potential (E°) is the voltage associated with a reduction reaction at an electrode when all solutes are and all gases are at
- a) 1M, 0 atm b) 0.1M, 1atm c) 1M, 1 atm d) 1M, 0.5 atm
- 7- For the Zn-Cu (Denial) cell, the anode material is
- a)Cu b) Zn c) Fe d) Sn
- 8- The Denial cell is considered
- a) Galvanic cell b) Electrolytic cell c) *Leclanché* cell d) non of these
- 9- The charge of the cathode in the Denial cell is
- a)positive b) negative c) negative or positive d) neutral
- 10- The reaction of the Denial cell is
- a)reversible b) non-spontaneous c) spontaneous d) none of these
- 11- The galvanic potential of a cell consist of iron ($E^\circ = -0.44\text{ V}$) and Copper ($E^\circ = 0.34\text{ V}$) is.....
- a) -0.78 V b) 0.78 V c) -0.10 V d) 0.10 V
- 12- The standard free energy of the above cell is
- a) 19.3 kJ mol^{-1} b) -19.3 kJ mol^{-1} c) 150.5 kJ mol^{-1} d) $-150.5\text{ kJ mol}^{-1}$
- 13- What is E° of a cell made of the following reaction [$E^\circ_{\text{Fe}^{2+}/\text{Fe}} = -0.44$, $E^\circ_{\text{Ag}^+/\text{Ag}} = 0.8\text{V}$]
- $$\text{Fe}^{2+}_{(\text{aq})} + 2\text{Ag}_{(\text{s})} \rightarrow \text{Fe} + 2\text{Ag}^{+}_{(\text{aq})}$$
- a) 0.36 V b) 1.24 V c) -1.24V d) -0.36V
- 14- What is the reduction potential of copper electrode in 0.01M Cu^{2+} ion solution at 25C, $E^\circ = 0.34\text{ V}$?
- a) 0.281 V b) 0.34 V c) -0.281V d) -0.34V
- 15- What is the value of E_{cell} for the voltaic cell: $\text{Pt} | \text{Fe}^{2+}(0.5\text{ M}), \text{Fe}^{3+}(0.20\text{ M}) || \text{Ag}^{+}(1.0\text{ M}) | \text{Ag}(\text{s})$, where $E^\circ_{\text{cell}} = 0.029\text{ V}$
- a) 0.053 V b) 0.011 V c) -0.053V d) -0.011V
- 16- The correct notation of the calomel electrode is
- a) $\text{Pt Hg}/\text{HgCl}_2\text{ Cl}^-$ b) $\text{Hg}/\text{Hg}_2\text{Cl}_2\text{ Cl}^-$ c) $\text{Pt Hg}/\text{Hg}_2\text{Cl}_2$ d) $\text{Pt Hg}/\text{Hg}_2\text{Cl}_2\text{ Cl}^-$
- 17- Will the following reaction occur at 25°C if $[\text{Fe}^{2+}] = 0.60\text{ M}$ and $[\text{Cd}^{2+}] = 0.010\text{ M}$?
- $$\text{Fe}^{2+}(\text{aq}) + \text{Cd}(\text{s}) \rightleftharpoons \text{Fe}(\text{s}) + \text{Cd}^{2+}(\text{aq})$$
- , where
- $E^\circ = -0.04\text{ V}$
- a) at equilibrium b) spontaneously c) non-spontaneously d) none of these
- 18- The hydrogen electrode potential takes the form
- a) $E = E^\circ - 0.0591\text{pH}$ b) $E = 0.0591\text{pH}$ c) $E = E^\circ + 0.0591\text{pH}$ d) $E = -0.0591\text{pH}$
- 19- The standard potential of the concentration cell usually takes the value.....
- a) < zero b) > zero c) zero d) one
- 20- Electrolysis of dilute sulfuric acid solution produces at anode electrode
- a) hydrogen gas b) oxygen gas c) sulfur d) none of these

21- What is the reduction potential of $(\text{Pt})\text{I}_2/\text{I}^-$ electrode in 0.1M KI solution at 25°C, $E^\circ=0.53\text{ V}$?

- a) 0.471V b) 0.589 V c) -0.589V d) -0.471V

22- The emf of the following cell at 25°C is 0.324V. $\text{Pt}|\text{H}_2(1\text{ atm})|\text{H}^+(\text{x M})||\text{KCl}(\text{sat})|\text{Hg}_2\text{Cl}_2|\text{Hg}$

Calculate the pH of the unknown soln., $E^\circ_{\text{cal}}=0.2415\text{ V}$

- a) 1.4 b) 3.44 c) 2.4 d) 1.85

23- Calculate the potential of the cell $\text{Pt}|\text{H}_2(1\text{ atm})|\text{H}^+(0.05\text{ M})||\text{H}^+(1.0\text{ M})|\text{H}_2(1\text{ atm})|\text{Pt}(\text{s})$

- a) 0.0592V b) -0.0592V c) 0.077V d) -0.077V

24-How many coulombs (C) of electrical charge must pass through an electrolytic cell to reduce 0.5 mol Ni^{2+} ion to nickel metal?

- a)100 C b) 24121C c) 48243 C d) 96485C

25- The material of the anode in the **Leclanché cell** is

- a)lead b) zinc c) graphite d) magnesium

26- The electrolyte composition of the **Leclanché cell** is

- a)ZnCl₂ paste b) NH₄Cl paste c) MgCl₂ and NH₄Cl paste d) ZnCl₂ and NH₄Cl paste

27- The material of the cathode in the lead storage battery is

- a)lead oxide b) zinc oxide c) graphite d) lead

28- The electrolyte solution of the lead storage battery is

- a) PbSO₄ b) Na₂SO₄ c) H₂SO₄ d) PbO₂

29- Hydrochloric acid solution is

- a)non-electrolyte b) strong electrolyte c) moderate electrolyte d) weak electrolyte

30- The mathematical form of salt activity (a_{salt}) for the CaBr₂ is

- a) $\text{C}^3\text{X}_\pm^3$ b) $4\text{C}\text{X}_\pm^3$ c) $4\text{C}^3\text{X}_\pm$ d) $4\text{C}^3\text{X}_\pm^3$

31-What is the ionic strength of 0.2 M MgCl₂?

- a)0.6 M b) 0.3 M c) 1.20 M d) 0.20 M

32- The fixed electric double layer is suggested by

- a)Gouy-Chapman b) Stern c) Helmholtz d) Others

33- What is the ionic strength of a solution containing mixture of 0.1 M MgBr₂ and 0.2 M KBr?

- a)0.2 M b) 0.1 M c) 1.0 M d) 0.5 M

34- The mathematical form of salt activity (a_{salt}) for the AlCl₃ is

- a) $9\text{C}^4\text{X}_\pm^4$ b) $9\text{C}^3\text{X}_\pm^3$ c) $27\text{C}^4\text{X}_\pm^4$ d) $27\text{C}^3\text{X}_\pm^3$

35- How many grams of copper would be electroplated by passing a constant current of 5.0 A through a solution of CuSO₄ for 100 min?

- a)0.155 g b) 6.35 g c) 9.87 g d) non of these

Part III Oral Exam

Answer (T) for true sentences or (F) for false sentences

- 1-- The oxidation state of Mn in KMnO₄ is +5.
- 2- The aqueous solution of glucose is weak electrolyte.
- 3- The electric double layer is formed at the metal-solution interface.
- 4- The cathode is the negative pole in the galvanic cell.
- 5- The material of the cathode in the mercury battery is steel.

End

Prof Abou-Elhagag Hermas



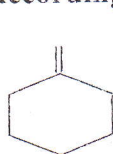
Final exam in 210 C course for second level's students

(50 marks)

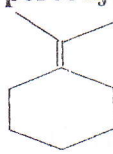
Answer the following questions:

Question No. 1. Choose the correct answer for the following questions:

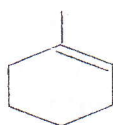
- Which of the following is polar aprotic solvent?
a. ethanol , b. n.hexane , c. acetone
- The reaction of toluene with bromine in the presence of sun light to give benzyl bromid is :
a. nucleophilic substitution reaction b. electrophilic substitution reaction
c. free radical substitution reaction
- Which of the following is not nucleophile?
a. $\text{CH}_2=\text{CH}_2$, b. C_6H_6 (benzene) , c. BF_3
- Reaction of HBr with ethylene in the presence of hydrogen peroxid considered :
a. nucleophilic addition reaction , b. electrophilic addition reaction
c. free radical addition reaction
- E1cb reaction was considered :
a. unimolecular elimination reaction , b. bimolecular elimination reaction , c. a and b
- According to hyperconjugated effect, which of the following is the more stable alkene:



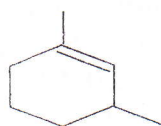
a



b



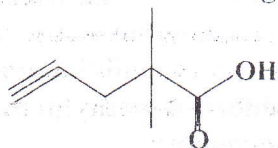
c



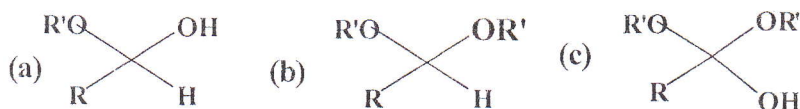
d

- Which of the following is not true about $\text{S}_\text{N}1$ mechanism ?
a. Multistep mechanism , b. Has more than one transition state , c. Kinetically second order
- Carbocation is :
a. sp^3 hyperdized carbon , b. nucleophile , c. has 6-electrons
- Vinyl chloride undergoes :
a. $\text{S}_\text{N}1$ mechanism , b. $\text{S}_\text{N}2$ mechanism , c. neither $\text{S}_\text{N}1$ nor $\text{S}_\text{N}2$
- Hydrogen shift or methyl shift rearrangement was occurred during :
a. $\text{S}_\text{N}1$ mechanism , b. $\text{S}_\text{N}2$ mechanism , c. E2 mechanism
- Carbanion stabilized by alkyl substituents by inductive effect and hyperconjugation
a. $\checkmark$, b. X
- The compound $\text{PhCH}_2\text{CH}_2\text{Cl}$ reacts with $\text{CH}_3\text{COONa/DMSO}$ via :
a. $\text{S}_\text{N}1$, b. $\text{S}_\text{N}2$, c. E2 , d. E1
- Which halide would react fastest in aqueous ethanol (solvolysis)
a. $(\text{CH}_3)_3\text{C-I}$, b. $(\text{CH}_3)_3\text{C-Br}$, c. $(\text{CH}_3)_3\text{C-Cl}$
- Nucleophilic substitution reaction that proceed via $\text{S}_\text{N}2$ is :
a. stereospecific with inversion of configuration
b. stereospecific with retention of configuration , c. non stereospecific
- Which of the following mechanism feature carbocation intermediate ?
a. $\text{S}_\text{N}1$, b. $\text{S}_\text{N}2$, c. E2 , d. both $\text{S}_\text{N}2$ and E2
- Which compound produces only one alkene when treated with sodium methoxide ?
a. 2-chloro-2-methylpentane , b. 3-chloro-2-methylpentane
c. 3-chloro-3-methylpentane , d. 2-chloro-4-methylpentane
- Methyl iodide reacts with $(\text{CH}_3)_3\text{CONa} / \text{t.BuOH}$ through :
a. $\text{S}_\text{N}2$ mechanisme , b. $\text{S}_\text{N}1$ mechanisme , c. E1 mechanisme , d. E2 mechanisme
- An inductive effect is :
a. the transfer of electrons along a pi bond b. transfer of electrons from a pi bond to a sigma bond
c. the transfer of electrons along a sigma bond d. the transfer of electrons across a benzene ring
- Which of the following statements apply to $\text{S}_\text{N}2$ reaction of alkylhalides ?

- a. Rate = $k[\text{base}]$, b. Rate = $k[\text{RX}]$, c. Rate = $k[\text{base}][\text{RX}]$
- 20) Isotopes used to find out :
 a. type of intermediates , b. which bond is broken , c. type of the reagent (Nu^- , E^+)
- 21) Which of the following is the strongest acid?
 a. $\text{CH}_3\text{CH}_2\text{CO}_2\text{H}$, c. $\text{ClCH}_2\text{CH}_2\text{CO}_2\text{H}$ b. $\text{ClCH}_2\text{CO}_2\text{H}$, d. $\text{CH}_3\text{CO}_2\text{H}$
- 22) Which of the following is *not* a nucleophile?
 a. H_2O , b. CH_3OH , c. H_2 , d. CN^-
- 23) Allylic carbocation is stable intermediate by:
 a. inductive effect , b. hyperconjugation , c. resonance
- 24) The most basic of the following molecules is :
 a. CH_3CONH_2 , c. $\text{CH}_3\text{CH}_2\text{NH}_2$ b. $(\text{CH}_3\text{CH}_2)_2\text{NH}$, d. $\text{C}_6\text{H}_5\text{NH}_2$
- 25) Hydrolysis of 1-chloro-3-methyl-2-butene gives
 a. primary alcohol only , b. tertiary alcohol only
 c. primary alcohol as minor product and tertiary alcohol as major product
 d. primary alcohol as major product and tertiary alcohol as minor product
- 26) Reaction of benzaldehyde and acetaldehyde in presence of NaOH is called.
 (a) Claisen reaction. (b) Cannizzaro reaction (c) Crossed Aldol.
- 27) Oxidation of primary alcohols to aldehydes in presence of $\text{PCC}/\text{CH}_2\text{Cl}_2$ is called.
 (a) Jones oxidation (b) Collins oxidation (c) Swern oxidation
- 28) Which reagent will reduce a carbonyl compounds to alcohols.
 (a) $\text{aq.}(\text{OH})$ (b) $\text{Zn}(\text{Hg})/\text{HCl}$ (c) LiAlH_4
- 29) The products formed when treatment of 2-propanone with ethylene glycol in acidic medium are:
 (a) Hemiacetal (b) Acetal (c) Cyclic acetal
- 30) α,β -Unsaturated carbonyl compounds undergo reaction with conjugated diene known as
 (a) Diels-Alder Reaction (b) Clemmensen Reaction (c) Aldol condensation
- 31) Which compound cannot be converted to a carboxylic acid by hydrolysis .
 (a) CH_3CHO (b) CH_3CONH_2 (c) CH_3CN
- 32) Cyanohydrine obtained from the reaction of RCHO with:
 (a) RMgX (b) HCN (c) H_2O
- 33) The reaction of PhMgBr with propanal, followed by hydrolysis give
 (a) 2-Phenylpropanol (b) 1-Phenyl-2-propanol (c) 1-Phenylpropanol
- 34) The major product from heating a mixture of CH_3CHO & NaOH is :
 (a) $\text{CH}_3\text{CH}=\text{CHCHO}$ (b) $\text{CH}_3\text{CH}_2\text{CH}=\text{CHCHO}$ (c) $(\text{CH}_3)_2\text{C}=\text{CHCHO}$
- 35) Treatment of $\text{C}_2\text{H}_5\text{OH}$ with KMnO_4/H^+ , then followed by addition of $\text{C}_2\text{H}_5\text{OH}/\text{H}^+$ give
 (a) Esters (b) Amines (c) Ketones
- 36) Conversion of a carboxylic acid to primary alcohol is known as. (a) Esterification
 (b) Reduction (c) Oxidation
- 37) Aldehyde reacts with Grignard reagent to give
 (a) Acids (b) Alcohols (c) Amides
- 38) Which of the following compound is the most reactive with dilute NaOH
 (a) $\text{CH}_3\text{COOC}_2\text{H}_5$ (b) CH_3COCl (c) CH_3CONH_2
- 39) What is the IUPAC name of the following compound



- (a) 4,4-Dimethyl-1-pentynoic acid (b) 2,2-Dimethyl-4-pentynoic acid
- 40) Which is normally the main product when a mixture of RCHO and an excess of $\text{R}'\text{OH}$ is treated with an acid catalyst.



41) Which pair of reactants for a Grignard reaction does not give triphenylmethanol after an aqueous workup

- (a) $\text{PhCHO} + 2\text{PhMgBr}$ (b) $\text{PhCOPh} + \text{PhMgBr}$ (c) $\text{PhCOOCH}_3 + \text{PhMgBr}$

42) Which combination of carbonyl compounds gives phenyl vinyl ketone (PhCO-CH=CH_2) by an aldol condensation.

- (a) $\text{PhCOCH}_3 + \text{HCHO}$ (b) $\text{PhCHO} + \text{CH}_3\text{CHO}$ (c) $\text{PhCHO} + \text{HCHO}$

43) What obtained when reacted $\text{C}_2\text{H}_5\text{MgBr}$ with CO_2 , followed by hydrolysis

- (a) α -Bromopropanoic acid (b) β -Bromopropanoic acid (c) propanoic acid

44) Which compound will give a good yield of the Claisen condensation product with NaOEt in EtOH

- (a) CH_3CHO (b) PhCHO (c) $\text{CH}_3\text{COOC}_2\text{H}_5$

45) The most common reactions of RCHO & R_2CO are

(a) Nucleophilic substitution reactions (b) Nucleophilic addition reactions (c) Electrophilic addition reactions

46) Aldehydes are more reactive than ketones due to:

- (a) Electronic effect (b) Steric effect (c) a & b

47) Deoxygenation of a carbonyl group to methylene group in excess of NH_2NH_2 , then heating with KOH called

- (a) Clemmenson (b) Wolff-Kishner

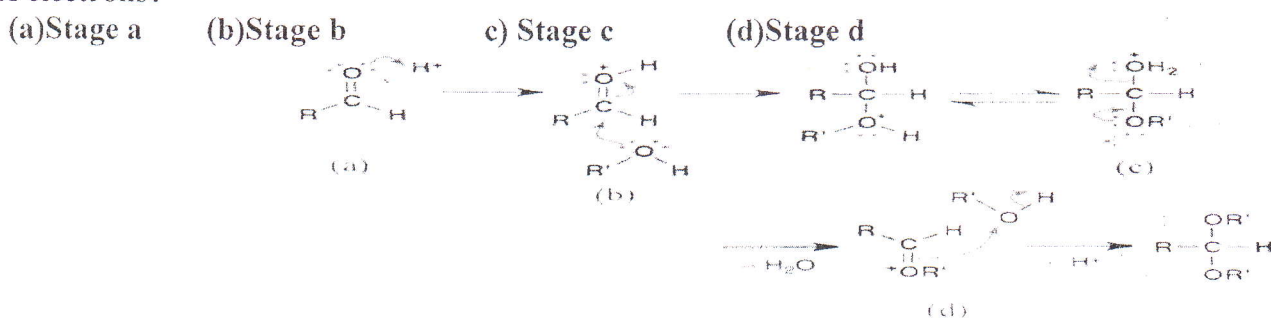
48) Triacetoxyperiodinane able to oxidize alcohol to RCOR is performed in:

- (a) $\text{CH}_2\text{Cl}_2/\text{r.t.}$ (b) $\text{DMSO}/(\text{COCl})_2$ (c) KMnO_4/H^+

49) Alkenes can be cleaved by O_3 followed by reduction to generate RCHO and/or RCOR through

- (a) Oxidation (b) Ozonolysis (c) Hydrolysis

50) Which stage of the following reaction scheme for acetal formation does not correctly show the flow of electrons?



Oral Exam:

Put (✓) in the front of correct statement and (X) in the front of wrong statement.....(10 marks):

- Alkenes reactions mostly electrophilic addition reactions
- E1cB reaction mechanism kinetically 2nd order reaction.
- Nitration of benzene was considered as nucleophilic substitution reaction.
- Trichloroacetic acid (CCl_3COOH) is more acidic than trifluoroacetic acid (CF_3COOH).
- Carbon tetrachloride (CCl_4) was considered polar solvent.
- Trichloroacetic acid is more acidic than acetic acid.
- 1,3-Dithiane can be used for preparing both RCHO & R_2CO .
- Carboxylic acids are less acidic than alcohol.
- Acidic carboxylic acid ester can react with itself under basic conditions to produce β -keto ester.
- Acetal can be used to protect RCHO & R_2CO from reacting with strong bases and nucleophile.

اجمل الامنيات بالتوفيق
الممتحنين

د. احمد عبده

د. زينب عبد الحميد حزين د. عادل محمد كمال د. اميمة سعد الطوخي

Assiut university

Academic Year : 2020/2021

Faculty of Science

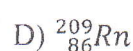
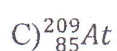
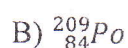
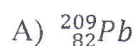
Time Allowed : three hours

Chemistry Department

Final exam. For Course No. 333C (nuclear and Radiochemistry)

يتم طمس الاجابة الصحيح بالقلم الجاف الازرق

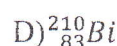
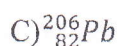
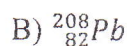
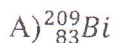
1) $^{213}_{83}\text{Bi}$ Decay with emission of α -particles. The resulting nuclide is unstable and emits a β - particle. The final nuclide formed is



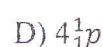
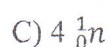
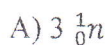
2) The symbol needed to complete the nuclear reaction $^{63}_{29}\text{Cu}(p, \dots)^{62}_{29}\text{Cu}$ is



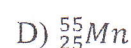
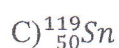
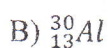
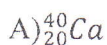
3) The terminal member of the naturally occurring radioactive which begin with $^{232}_{92}\text{Th}$ is



4) An atom of $^{235}_{92}\text{U}$ after absorption of a slow neutron undergoes fission to form an atom of $^{139}_{54}\text{Xe}$ and an atom of $^{94}_{38}\text{Sr}$. The other particles produces are



5) Which of the following nuclides is most likely to be unstable?



6) The half-life of $^{90}_{38}\text{Sr}$ is 20 y. If a sample of this nuclide has an initial activity of 8000 dpm today .The activity after 80 y is

A) 400 dpm

B) 200 dpm

C) 500 dpm

D) 300 dpm

7) F-18 is found to undergo 90% radioactive decay in 366 min. The half-life from this observation is

A) 110 min.

B) 90 min.

C) 210 min.

D) 70 min.

8) Given 2.00 Kg of $^{238}_{92}\text{U}$ ($T_{1/2} = 4.5 \times 10^9 \text{ y}$). The ultimate decay product of this series is $^{206}_{82}\text{Pb}$. The weight of $^{206}_{82}\text{Pb}$ produced after $3.00 \times 10^9 \text{ y}$ is

- A) 0.64 Kg Pb B) 1.26 Kg Pb C) 0.75 Kg Pb D) 2.5 Kg Pb

9) The half-life of Pb-212 is 10.6 h : that of its daughter is 60.5 min. The time it will take for a maximum daughter activity to grow in freshly prepared sample of Pb-212 is

- A) 3.78 h B) 1.52 h C) 2.71 h D) No equilibrium exists

10) The specific activity of the carrier free In- 111 ($T_{1/2} = 67\text{h}$) is

- A) $4.22 \times 10^5 \text{ mci}$ B) $2.42 \times 10^3 \text{ mci}$ C) $3.1 \times 10^4 \text{ mci}$ D) $5.4 \times 10^2 \text{ mci}$

11) The duration of time necessary to produce 600 mci of Mo-99

($T_{1/2} = 67 \text{ h}$) by irradiating 4 g of U-235 in the nuclear reactor whose thermal neutron flux is $2 \times 10^{14} \text{ n/cm}^2 \cdot \text{sec}$ (assume the formation cross section of Mo-99 is 20 m barns) is

- A) 60.7 h B) 75.4 h C) 30.2 h D) 90.3 h

12) The half-lives of Mo-99 and Tc-99m are 67 h and 6 h respectively and both are in transient equilibrium in a sample. If the activity of Mo-99 is 75 mci the activity of Tc-99m (assume 87% Mo-99 decay to Tc-99m) is

- A) 71.7 m B) 62.3 mci C) 40.8 mci D) 100.2 mci

13) The nuclear spin and parity of $^{21}_{12}\text{Mg}$ is

- A) $5/2^+$ B) $1/2^+$ C) 1^+ D) 0^+

14) The nuclear spin and parity of $^{26}_{13}\text{Al}$ is

- A) 3^+ B) $1/2^+$ C) 5^+ D) 2^+

15) The activity of a Na-22 source which gives a dose rate of $64 \mu\text{Sv/h}$ 1 m (Na-22 emits one gamma ray photon of energy 1.28 MeV per disintegration) is

- A) 400 MBq B) 300 MBq C) 500 MBq D) 100 MBq

16) The dose rate close to a valve is $160 \mu\text{Sv/h}$. If this is due to Co-60 inside the valve, the lead shielding must be placed around the valve to reduce the dose rate to $10 \mu\text{Sv/h}$ (HTV of lead for Co-60 gamma ray is 12.5 mm) is

- A) 50 mm B) 40 mm C) 100 mm D) 70 mm

17) 1R (Roentgen) is

- A) 2.58×10^{-4} C/Kg of one sign of charge in air
B) 2.58×10^{-4} C/Kg of two sign of charge in air
C) 1.58×10^{-4} C/Kg of one sign of charge in air
D) 1.58×10^{-4} C/Kg of two sign of charge in air

18) Absorbed dose is

- A) Energy absorbed /unit mass of material and the SI unit is Rad
B) Energy absorbed /unit mass of material and the SI unit is Gray (Gy)
C) Energy absorbed /unit length of material and the SI unit is Rad
D) Energy absorbed /unit length of material and the SI unit is Gray (Gy)

19) The Dose Equivalent is

- A) Absorbed dose x quality factor and the SI unit is Sievert
B) Absorbed dose and the SI unit is Sievert
C) Exposure dose x quality factor and the SI unit is Sievert
D) Exposure dose x quality factor and the SI unit is Sievert

20) Auger electrons are

- A) Alternative of X-ray emission and are monenergetic
B) Alternative of X-ray emission and are heteroenergetic
C) Alternative of gamma-ray emission and are monenergetic
D) Alternative of gamma-ray emission and are heteroenergetic

21) Attenuation of gamma ray in matter is

- A) Attenuation = scattering + absorption of γ -ray photons

B) Attenuation = scattering + transmission of γ -ray photons

C) Attenuation = scattering only of γ -ray photons

D) Attenuation = absorption of γ -ray photons

22) Photoelectric effect is

A) Removal of electron from inner shell of the atom and emission of characteristic X-ray (fluorescent) or low energy Auger electrons

B) Photoelectric interactions are most probable for low atomic number material and for high energy photons

C) Removal of electron from outer shell of the atom and emission of characteristic X-ray (fluorescent) or low energy Auger electrons

D) None of these events

23) Neutron Capture process is

A) Interaction of thermal neutron with nucleus and formation of isotope of the nuclide

B) Interaction of thermal neutron with nucleus and formation of isobar of the nuclide

C) Interaction of thermal neutron with nucleus and formation of isomer of the nuclide

D) Interaction of thermal neutron with nucleus and formation of isotone of the nuclide

24) If a β^- and β^+ annihilate each other and their mass are converted to two gamma-rays of equal energy. The energy in MeV of each is

A) 1.02 MeV

B) 0.511 MeV

C) 2.04 MeV

D) 3.01 MeV

25) In the nuclear reaction ${}^{43}_{20}\text{Ca}(\alpha, \dots){}^{46}_{21}\text{Sc}$. The missing particle is

A) n

B) d

C) γ

D) p

26- Na-22 nuclide decay by:

(a) β^- emission

(b) β^+ emission

(c) EC

(d) IC

27- The mean life τ of a group of the nuclide is:

- (a) $\tau = 1.44 T_{1/2}$ (b) $\tau = T_{1/2}$ (c) $\tau = 1/2 T_{1/2}$ (d) $\tau = 2 T_{1/2}$

28- The α -rays are:

- (a) nuclei of H atom (b) nuclei of T atoms (c) nuclei of He atoms (d) nuclei of D atoms

29- The SI unit of absorbed dose is:

- (a) Rad (b) Roentgen (c) Gray (d) Sievert

30- From the following isobars: S-40, Cl-40, Ar-40, and K-40 the stable one is:

- (a) S-40 (b) Cl-40 (c) Ar-40 (d) K-40

31- In Case of No- equilibrium between parent and daughter in radioactive decay:

- (a) $T_{1/2}(\text{parent}) > T_{1/2}(\text{daughter})$ (b) $T_{1/2}(\text{parent}) < T_{1/2}(\text{daughter})$ (c) $T_{1/2}(\text{parent}) = T_{1/2}(\text{daughter})$ (d) $T_{1/2}(\text{parent}) = 2 T_{1/2}(\text{daughter})$

32- β^- rays are:

- (a) Mon energetic particles (b) Heavy charged nuclides (c) Electromagnetic radiation (d) Hetero energetics particles

33- (n, α) reaction leads to:

- (a) Production of isobar of the nucleus
(b) Production of isotone of the nucleus
(c) Production of isomer of the nucleus
(d) Production of isotope of the nucleus

34- The nuclide which lie in the band of stability is:

- (a) Rn-222 (b) Pb -211 (c) C-14 (d) Fe-56

35- In the nuclear reaction ${}_{13}^{27}\text{Al} + {}_2^4\text{He} \rightarrow ? + {}_0^1n$, the missing nuclide is:

- (a) ${}_{15}^{30}\text{P}$ (b) ${}_{7}^{15}\text{N}$ (c) ${}_{6}^{15}\text{C}$ (d) ${}_{8}^{15}\text{O}$

36- From the following nuclei, Cr-53, Mn-51, Fe-59, P-32, the most likely one to decay by positron emission is:

- (a) Cr-53 (b) Mn-51 (c) Fe-59 (d) P-32

37- Which of the following, $^{14}_7\text{N}$, $^{23}_{11}\text{Na}$, $^{16}_8\text{O}$ and $^{18}_9\text{F}$ is doubly magic number?

- (a) $^{18}_9\text{F}$ (b) $^{14}_7\text{N}$ (c) $^{16}_8\text{O}$ (d) $^{23}_{11}\text{Na}$

38- Which of the following, $^{14}_7\text{N}$, $^{23}_{11}\text{Na}$, $^{16}_8\text{O}$ and $^{18}_9\text{F}$ has more stable isotopes?

- (a) $^{18}_9\text{F}$ (b) $^{14}_7\text{N}$ (c) $^{16}_8\text{O}$ (d) $^{23}_{11}\text{Na}$

39- Which of the following nuclides do you expect to be radioactive?

- (a) Ne-20 (b) W-184 (c) Ti-51 (d) Fe-56

40- The mode of decay you expect for $^{235}_{92}\text{U}$ is:

- (a) β^- decay (b) β^+ decay (c) EC (d) α -decay

41- For the nuclear reaction $^{99\text{m}}_{43}\text{Tc} \rightarrow ^{99}_{43}\text{Tc}$ the mode of radioactive decay is

- (a) β^- (b) β^+ (c) α -decay (d) IT

42- The missing particle in the nuclear reaction: $^{64}_{29}\text{Cu} \rightarrow ^{64}_{28}\text{Ni}$ is:

- (a) β^- (b) β^+ (c) α -decay (d) IC

43- The nucleus with the greatest binding energy is:

- (a) ^1_1H (b) $^{56}_{26}\text{Fe}$ (c) $^{16}_8\text{O}$ (d) $^{30}_{15}\text{P}$

44- A radionuclide has $T_{1/2} = 3.75$ min. the time will it take for 4.0 mole sample of the material to decay to 0.125 mole is:

- (a) 7.50 min. (b) 11.2 min. (c) 15.00 min. (d) 18.75 min.

45- The particle absorbed when $^{58}\text{Fe} \rightarrow ^{59}\text{Fe}$

- (a) α particle (b) neutron (c) electron (d) γ -ray

46- $^{175}_{78}\text{Pt}$ Spontaneously decay into $^{171}_{76}\text{Os}$. The missing particle in this decay is:

- (a) α - particle (b) β - particle (c) γ - decay (d) C-12 atom

47- N-12 is most likely to decay by:

- (a) γ - emission (b) β - emission (c) EC (d) IT

48- Bi-212 ($T_{1/2} = 60.60$ min) decay by 36% α -decay and 64% β^- -decay, the $T_{1/2}$ for α -decay is:

(a) 100 min. (b) 168 min. (c) 50 min. (d) 70 min.

49- The missing particle in the nuclear reaction: $^{14}_7\text{N} + ^4_2\text{He} \rightarrow ? + ^1_1\text{P}$ is

(a) $^{17}_8\text{O}$ (b) $^{16}_8\text{O}$ (c) $^{15}_8\text{O}$ (d) $^{18}_8\text{O}$

50- The missing particle in the nuclear reaction is $^{230}_{90}\text{Th} \rightarrow ^{226}_{88}\text{Ra}$

(a) β^- - particles (b) β^+ - particles (c) EC (d) α - particles

$$1\text{Ci} = 3.7 \times 10^{10} \text{ Bq}, 1\text{b} = 1 \times 10^{-24} \text{ cm}^2, N_A = 6.003 \times 10^{23} \text{ mole}^{-1}, \\ m_p = 1.00727 \text{ u}, m_n = 1.00866 \text{ u}.$$

Good luck

R.M.Mahfouz



First Semester final Examination 2020 / 2021

Subject: Course 393B

(Microbial toxins)

Students: (Microbiology; Chemistry and Microbiology sections)

General Instructions: -Answer the following questions.

Q1. Place a tick (True) or (False) on the following. (35 marks)

1. Sterigmatocystin causes liver tumor and has a potency estimated as 0.5 that of aflatoxin B₁. ()
2. Patulin is destroyed by pasteurization during juice manufacturing. ()
3. Chemically, aflatoxin G₁ molecule increases by 2 oxygen atoms than that of aflatoxin B₁. ()
4. Many trichothecen toxins have been naturally occurred in foodstuffs. ()
5. Chemically, ochratoxin A is isocoumarin ring fused to phenylalanine. ()
6. Sterigmatocystin is the penultimate precursor of aflatoxins. ()
7. Citrinin has potent effect on mammalian kidneys. ()
8. Not all mycotoxins are derived from primary metabolites. ()
9. Anthrax toxin enter target cells by direct entry mechanism. ()
10. Diphtheria toxin is exotoxin of A/B prototype. ()
11. Cholera toxin activates adenylate enzyme in cells of the intestinal mucosa forming pumps for water and electrolytes from the cholera-damaged cells causing diarrhea and dehydration. ()
12. Algal biotoxins are produced by volvocales and considered as potent toxins. ()
13. Saxitoxins are belonging to Paralytic shellfish toxins and can be produced by *Nostoc*. ()
14. Nodularin is a neurotoxin produced by *Nodularia spumigena*. ()
15. Microcystin is hepatopeptide toxin produced by *Microcystis aeruginosa*. ()
16. Toxins of pathogenic bacteria serve as secondary virulence factors. ()
17. Exotoxins are soluble carbohydrates secreted by living bacteria during exponential growth phase. ()
18. Anthrax infection can be occurred by inhalation. ()
19. Anatoxins are a group of neurotoxins. ()
20. Paralytic shellfish toxins are related to coumarines. ()
21. Nodularin is composed of octapeptides which inhibits protein phosphatase in the liver. ()
22. Cylindrospermopsin is a cyclic alkaloid that inhibits protein synthesis and accumulates lipid compounds in liver. ()

Diphtheria toxin infects host tissues through direct entry and receptor-mediated endocytosis mechanisms. ()

- 24. Cyanobacterial toxins are released primarily from growing cells. ()
- 25. Ozonation and filtration are non-efficient in the removal of cyanobacterial toxins ()
- 26. Toxoids are detoxified toxins which retain their antigenicity and their immunizing capacity. (-)
- 27. Chemically, molecules of aflatoxins B, G and M groups contains 17 carbon atoms. ()
- 28. Patulin toxin have been reported in vegetables, cereal grains and animal silage. ()
- 29. Ergot Alkaloids cause hemorrhaging in the brain and lungs. ()
- 30. Cyldrospersmopsin inhibits protein phosphatases 1A and 2A in the liver. ()
- 31. Bacterial non protein toxins are extremely powerful biological poisons in small amount. ()
- 32. Domoic acid is potent phosphatase inhibitors and this property is linked to inflammation of the intestinal tract and diarrhoea in human. ()
- 33. Bacterial endotoxins are byproducts of bacterial metabolism. ()
- 34. Ergot alkaloids transferred to the milk of cows consumed ergot. ()
- 35. Fumonisin consists of a xanthone nucleus attached to a bifuran structure. ()

Q2. Choose the correct answer. (15 marks)

- 36. What is the mycotoxin that used to treat heavy bleeding after birthing?
 - a. patulin
 - b. citrinin
 - c. ergometrine
 - d. alternariol
- 37. Which one of the following mycotoxins is formed from partial metabolization of aflatoxins B₁?
 - a. aflatoxin B_{2a}
 - b. aflatoxin G₂
 - c. aflatoxin M₁
 - d. aflatoxicol
- 38. Which one of the following is the main ochratoxin A producer in cold regions?
 - a. *P. citrinum*
 - b. *P. viridicatum*
 - c. *A. niger*
 - d. *A. terreus*
- 39. Which one of the following trichothecenes is related to group A?
 - a. T₂-toxin
 - b. nivalenol
 - c. deoxynivalenol
 - d. verrucarol
- 40. Which one of the following is similar to aflatoxins in biosynthetic pathway and produced by several fungal species?
 - a. ochratoxin A
 - b. fumonisin B₁
 - c. patulin
 - d. sterigmatocystin
- 41. Which of the following fungi is the main patulin producer on apples?
 - a. *A. terreus*
 - b. *P. expansum*
 - c. *A. niger*
 - d. *P. citrinum*

- Which one of the following causes oesophageal cancer?
- fumonisin B₁
 - patulin
 - afl.B₁
 - ergometrine
43. Which one of the following mycotoxin groups is associated with rotting fruits?
- aflatoxins
 - alternaria toxins
 - ochratoxins
 - fuminsins
44. Which one of the following mycotoxin groups causes alimentary toxic aleukia?
- aflatoxins
 - ochratoxins
 - trichothecenes
 - ergot toxins
45. What does the A subunit in AB toxin stand for?
- accumulation
 - binding
 - enzymatic Activity
 - adhesion
46. Which one of the following is a property of lipopolysaccharides?
- heat resistant
 - highly potent
 - heat sensitive
 - secreted by living bacteria
47. Which one of the following is involved in toxoids formation?
- protein toxin
 - lipopolysaccharides
 - proline
 - glucose
48. Which one of the following is nephrotoxin?
- aflatoxin
 - tenuazonic acid
 - ochratoxin
 - argot toxin
49. Which one of the following is belonging to Neurotoxic Shellfish Poisoning (NSP)?
- brevetoxins
 - saxitoxins
 - okadaic acid
 - domic acid
50. Which one of the following is the producer microorganism for aphanotoxins?
- Aphanizomenon flosaquae*
 - Anabaena circinalis*
 - both A & B
 - non of them

Good luck
 Prof. Dr. Ahmed Lotfy El-Sayed
 Dr/ Maysa M. A. Ali

Assiut university

Academic Year : 2020/2021

Faculty of Science

Time Allowed : two hours

Chemistry Department

Final exam. For Course No. 301C (nuclear and Radiochemistry)

يتم طمس الاجابة الصحيح بالقلم الجاف الازرق

1) $^{213}_{83}\text{Bi}$ Decay with emission of α -particles. The resulting nuclide is unstable and emits a β - particle. The final nuclide formed is

- A) $^{209}_{82}\text{Pb}$ B) $^{209}_{84}\text{Po}$ C) $^{209}_{85}\text{At}$ D) $^{209}_{86}\text{Rn}$

2) The symbol needed to complete the nuclear reaction $^{63}_{29}\text{Cu}(p, \dots)^{62}_{29}\text{Cu}$ is

- A) D B) n C) α D) γ

3) The terminal member of the naturally occurring radioactive which begin with $^{232}_{92}\text{Th}$ is

- A) $^{209}_{83}\text{Bi}$ B) $^{208}_{82}\text{Pb}$ C) $^{206}_{82}\text{Pb}$ D) $^{210}_{83}\text{Bi}$

4) An atom of $^{235}_{92}\text{U}$ after absorption of a slow neutron undergoes fission to form an atom of $^{139}_{54}\text{Xe}$ and an atom of $^{94}_{38}\text{Sr}$. The other particles produces are

- A) $3\frac{1}{0}\text{n}$ B) $3\frac{1}{1}\text{p}$ C) $4\frac{1}{0}\text{n}$ D) $4\frac{1}{1}\text{p}$

5) Which of the following nuclides is most likely to be unstable?

- A) $^{40}_{20}\text{Ca}$ B) $^{30}_{13}\text{Al}$ C) $^{119}_{50}\text{Sn}$ D) $^{55}_{25}\text{Mn}$

6) The half-life of $^{90}_{38}\text{Sr}$ is 20 y. If a sample of this nuclide has an initial activity of 8000 dpm today .The activity after 80 y is

- A) 400 dpm B) 200 dpm C) 500 dpm D) 300 dpm

7) F-18 is found to undergo 90% radioactive decay in 366 min. The half-life from this observation is

- A) 110 min. B) 90 min. C) 210 min. D) 70 min.

8) Given 2.00 Kg of $^{238}_{92}\text{U}$ ($T_{1/2}=4.5 \times 10^9 \text{ y}$). The ultimate decay product of this series is $^{206}_{82}\text{Pb}$. The weight of $^{206}_{82}\text{Pb}$ produced after $3.00 \times 10^9 \text{ y}$ is

- A) 0.64 Kg Pb B) 1.26 Kg Pb C) 0.75 Kg Pb D) 2.5 Kg Pb

9) The half-life of Pb-212 is 10.6 h : that of its daughter is 60.5 min. The time it will take for a maximum daughter activity to grow in freshly prepared sample of Pb-212 is

- A) 3.78 h B) 1.52 h C) 2.71 h D) No equilibrium exists

10) The specific activity of the carrier free In- 111 ($T_{1/2}=67\text{h}$) is

- A) $4.22 \times 10^5 \text{ mci}$ B) $2.42 \times 10^3 \text{ mci}$ C) $3.1 \times 10^4 \text{ mci}$ D) $5.4 \times 10^2 \text{ mci}$

11) The duration of time necessary to produce 600 mci of Mo-99

($T_{1/2}=67 \text{ h}$) by irradiating 4 g of U-235 in the nuclear reactor whose thermal neutron flux is $2 \times 10^{14} \text{ n/cm}^2 \cdot \text{sec}$ (assume the formation cross section of Mo-99 is 20 m barns) is

- A) 60.7 h B) 75.4 h C) 30.2 h D) 90.3 h

12) The half-lives of Mo-99 and Tc-99m are 67 h and 6 h respectively and both are in transient equilibrium in a sample .If the activity of Mo-99 is 75 mci the activity of Tc-99m (assume 87% Mo-99 decay to Tc-99m) is

- A) 71.7 m B) 62.3 mci C) 40.8 mci D) 100.2 mci

13) The nuclear spin and parity of $^{21}_{12}\text{Mg}$ is

- A) $5/2^+$ B) $1/2^+$ C) 1^+ D) 0^+

14) The nuclear spin and parity of $^{26}_{13}\text{Al}$ is

- A) 3^+ B) $1/2^+$ C) 5^+ D) 2^+

15) The activity of a Na-22 source which gives a dose rate of $64 \mu\text{Sv/h}$ 1 m (Na-22 emits one gamma ray photon of energy 1.28 MeV per disintegration) is

- A) 400 MBq B) 300 MBq C) 500 MBq D) 100 MBq

16) The dose rate close to a valve is $160 \mu\text{Sv/h}$. If this is due to Co-60 inside the valve, the lead shielding must be placed around the valve to reduce the dose rate to $10 \mu\text{Sv/h}$ (HTV of lead for Co-60 gamma ray is 12.5 mm) is

- A) 50 mm B) 40 mm C) 100 mm D) 70 mm

17) 1R (Roentgen) is

- A) 2.58×10^{-4} C/Kg of one sign of charge in air
B) 2.58×10^{-4} C/Kg of two sign of charge in air
C) 1.58×10^{-4} C/Kg of one sign of charge in air
D) 1.58×10^{-4} C/Kg of two sign of charge in air

18) Absorbed dose is

- A) Energy absorbed /unit mass of material and the SI unit is Rad
B) Energy absorbed /unit mass of material and the SI unit is Gray (Gy)
C) Energy absorbed /unit length of material and the SI unit is Rad
D) Energy absorbed /unit length of material and the SI unit is Gray (Gy)

19) The Dose Equivalent is

- A) Absorbed dose x quality factor and the SI unit is Sievert
B) Absorbed dose and the SI unit is Sievert
C) Exposure dose x quality factor and the SI unit is Sievert
D) Exposure dose x quality factor and the SI unit is Sievert

20) Auger electrons are

- A) Alternative of X-ray emission and are monenergetic
B) Alternative of X-ray emission and are heteroenergetic
C) Alternative of gamma-ray emission and are monenergetic
D) Alternative of gamma-ray emission and are hetroenergetic

21) Attenuation of gamma ray in matter is

- A) Attenuation = scattering + absorption of γ -ray photons

B) Attenuation = scattering + transmission of γ -ray photons

C) Attenuation = scattering only of γ -ray photons

D) Attenuation = absorption of γ -ray photons

22) Photoelectric effect is

A) Removal of electron from inner shell of the atom and emission of characteristic X-ray (fluorescent) or low energy Auger electrons

B) Photoelectric interactions are most probable for low atomic number material and for high energy photons

C) Removal of electron from outer shell of the atom and emission of characteristic X-ray (fluorescent) or low energy Auger electrons

D) None of these events

23) Neutron Capture process is

A) Interaction of thermal neutron with nucleus and formation of isotope of the nuclide

B) Interaction of thermal neutron with nucleus and formation of isobar of the nuclide

C) Interaction of thermal neutron with nucleus and formation of isomer of the nuclide

D) Interaction of thermal neutron with nucleus and formation of isotone of the nuclide

24) If a β^- and β^+ annihilate each other and their mass are converted to two gamma-rays of equal energy. The energy in MeV of each is

A) 1.02 MeV B) 0.511 MeV C) 2.04 MeV D) 3.01 MeV

25) In the nuclear reaction ${}^{43}_{20}\text{Ca}(\alpha, \dots){}^{46}_{21}\text{Sc}$. The missing particle is

A) n B) d C) γ D) p

26- Na-22 nuclide decay by:

(a) β^- emission (b) β^+ emission (c) EC (d) IC

27- The mean life τ of a group of the nuclide is:

- (a) $\tau = 1.44 T_{1/2}$ (b) $\tau = T_{1/2}$ (c) $\tau = 1/2 T_{1/2}$ (d) $\tau = 2 T_{1/2}$

28- The α -rays are:

- (a) nuclei of H atom (b) nuclei of T atoms (c) nuclei of He atoms (d) nuclei of D atoms

29- The SI unit of absorbed dose is:

- (a) Rad (b) Roentgen (c) Gray (d) Sievert

30- From the following isobars: S-40, Cl-40, Ar-40, and K-40 the stable one is:

- (a) S-40 (b) Cl-40 (c) Ar-40 (d) K-40

31- In Case of No- equilibrium between parent and daughter in radioactive decay:

- (a) $T_{1/2}(\text{parent}) > T_{1/2}(\text{daughter})$ (b) $T_{1/2}(\text{parent}) < T_{1/2}(\text{daughter})$ (c) $T_{1/2}(\text{parent}) = T_{1/2}(\text{daughter})$ (d) $T_{1/2}(\text{parent}) = 2 T_{1/2}(\text{daughter})$

32- β^- rays are:

- (a) Mon energetic particles (b) Heavy charged nuclides (c) Electromagnetic radiation (d) Hetero energetics particles

33- (n, α) reaction leads to:

- (a) Production of isobar of the nucleus
(b) Production of isotone of the nucleus
(c) Production of isomer of the nucleus
(d) Production of isotope of the nucleus

34- The nuclide which lie in the band of stability is:

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Good luck

R.M.Mahfouz

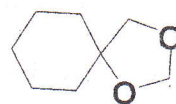
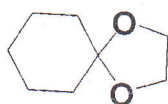


Final Exam In Stereochemistry and Spectroscopy
for 3rd Level Students (C-311)

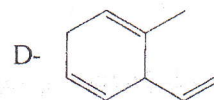
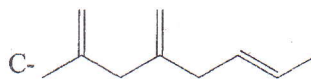
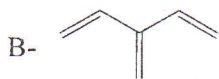
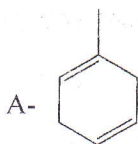
يتم طمس (تسويد) الإجابة المختارة من قبل الطالب باستخدام القلم الجاف فقط.

Q1: Choose the correct answer A, B, C, or D: (1 Mark/each)

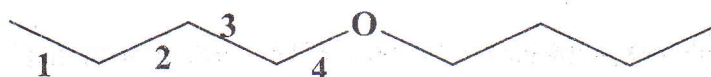
- 1- How many signals appear in proton-decoupled ^{13}C NMR of 3,4-dimethylhexane?
A- Four. B- Five. C- Six. D- Eight.
- 2- What is the relative area of each peak in a triplet spin-spin splitting pattern?
A- 1:4:1. B- 1:2:1. C- 1:3:1. D- None of them.
- 3- How many signals appear in ^1H NMR of acetic acid?
A- Two. B- Three. C- Four. D- None of them.
- 4- Which of the methods below would be most useful in distinguishing between the following compounds:



- A- Mass spectrometry. B- UV spectroscopy. C- IR spectroscopy. D- None of them.
- 5- Which of the following is an example of a conjugated dienes?



- 6- Which of C-C bond would most likely break and give fragments in mass spectrum?

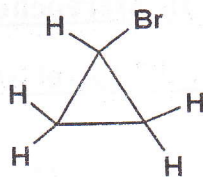


- A- 1. B- 2. C- 3. D- 4.
- 7- Which of the following statements is true concerning infrared spectroscopy?

- A- IR spectroscopy can be used to easily determine molecular mass.
B- IR spectroscopy is used to determine the frequency of vibrations between atoms.
C- IR spectroscopy is used to determine the shape of the carbon backbone.

D- The fingerprint region is most easily used to determine the functional groups in the molecule.

8- How many signals would you expect to see in the ^1H NMR spectrum of the following compound:



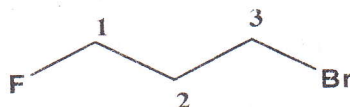
A- 1.

B- 2.

C- 3.

D- 4.

9- Which of the following protons gives NMR signal with the highest chemical shift value:



A- 1.

B- 2.

C- 3.

D- None of them.

10- Which molecule would have the most downfield signal for methyl group in proton NMR:

A- CH_3OH .

B- CH_3SH .

C- CH_3NH_2 .

D- A and C.

11- An unknown hydrocarbon has peaks at $m/z = 29$ and 43 , and an M^+ peak at $m/z = 58$ in the mass spectrum. What is the chemical formula for the hydrocarbon?

A- C_2H_6 .

B- C_3H_7 .

C- C_2H_5 .

D- C_4H_{10} .

12- How many peaks or signals would you expect to observe in the $\text{C-}^{13}\text{NMR}$ spectrum of ethyl acetate?

A- 2.

B- 3.

C- 4.

D- 5.

13- If you were to take ALL of the integration values from the $^1\text{H-NMR}$ spectrum of acetone and add them together, what would be the TOTAL number of hydrogens you would get?

A- 2.

B- 3.

C- 5.

D- 6.

14- How many peaks or signals would you expect to observe in the $^1\text{H-NMR}$ spectrum of ethyl acetate?

A- 3.

B- 5.

C- 2.

D- 4.

15- A molecule has no peaks near 3000 cm^{-1} in its IR spectrum. What we can say about this molecule?

A- The molecule may be a hydrocarbon, but we need to check the fingerprint region..

B- The molecule must not be a hydrocarbon.

C- IR spectroscopy cannot be used on hydrocarbons, so we should not be surprised to get this result.

D- The molecule breaks up into fragments, so we cannot see the characteristic peaks near 3000 cm^{-1} .

16- How does IR spectroscopy identify different molecules?

- A- By measuring the vibrational movement and absorption of each bond.
- B- By measuring the weight of each atom.
- C- By watching how the molecule reacts to different compounds
- D- By breaking apart the molecule into individual atoms.

17- In infrared spectroscopy which frequency range is known as the fingerprint region?

- A- $400 - 1400 \text{ cm}^{-1}$.
- B- $1400 - 900 \text{ cm}^{-1}$.
- C- $900 - 600 \text{ cm}^{-1}$.
- D- $600 - 250 \text{ cm}^{-1}$.

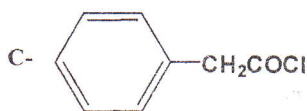
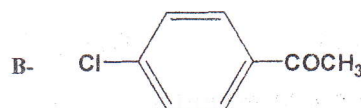
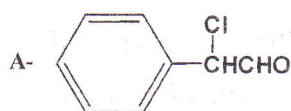
18- Which of the following statement is false for mass spectroscopy?

- A- Mass spectroscopy is used to identify unknown compounds within a sample, and to elucidate the structure and chemical properties of different molecules.
- B- Particle are characterized by their mass to charge ratios (m/z) and relative abundances.
- C- This technique basically studies the effect of ionizing energy on molecules
- D- This technique can be used on all state of matter.

19- In which state of matter mass spectroscopy is being performed?

- A- Solid.
- B- Liquid.
- C- Gaseous.
- D- Plasma.

20- A compound of molecular formula $\text{C}_8\text{H}_7\text{ClO}$ shows a prominent band in its IR spectrum at 1690 cm^{-1} . ^1H NMR spectrum revealed only two major types of protons in the ratio of 5: 2. Which one of the following structures best fits the above data?



21- Which type of ionic species are allowed to pass through the slit and reach the collecting plate?

- A- Negative ions of all masses.
- B- positive ions of the specific mass.
- C- Negative ions of the specific mass.
- D- Positive ions of all masses.

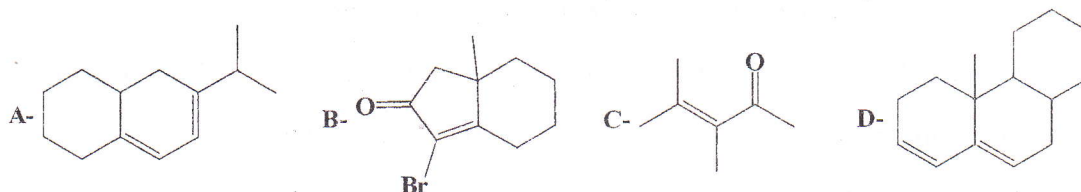
22- What is the wavelength range for UV spectrum of light.

- A- $400 \text{ nm} - 700 \text{ nm}$.
- B- 700 nm to 1 mm .
- C- 0.01 nm to 10 nm .
- D- 10 nm to 400 nm .

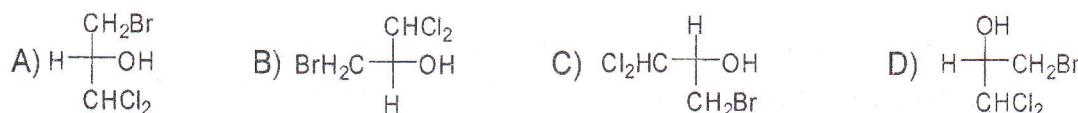
23- How many signals does the aldehyde $(\text{CH}_3)_3\text{CCH}_2\text{CHO}$ have in ^1H NMR and ^{13}C NMR spectra?

- A- Five ^1H signals and six ^{13}C signals. B- Three ^1H signals and four ^{13}C signals.
C- Five ^1H signals and four ^{13}C signals. D- Three ^1H signals and six ^{13}C signals.

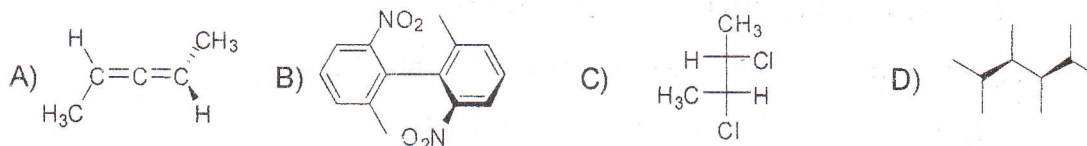
24- An example for Heteroannular diene is:



25- is the Fischer projection of (S) 3-bromo-1,1-dichloro-2-propanol.



26- is an achiral compound.



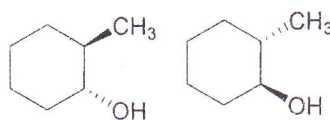
27- An optically pure (S)-stereoisomer of a molecule A has a specific rotation of -20° . The amount of R isomer is in a mixture with $[\alpha]_D^{20}$ equals $+14^\circ$.

- A) 85 %. B) 15 %. C) 70 %. D) 30 %.

28- When 0.25 kg D-lactose is dissolved in 0.5 L of water and placed in a 5 cm cell, the observed rotation would be ($[\alpha]_D^{20} = +52 \text{ deg} \cdot \text{mL} \cdot \text{g}^{-1} \cdot \text{dm}^{-1}$).

- A) -13° B) $+13^\circ$ C) $+208^\circ$ D) -208°

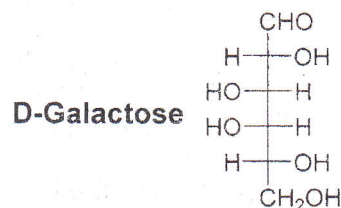
29- The two compounds of 2-methylcyclohexan-1-ol illustrated are



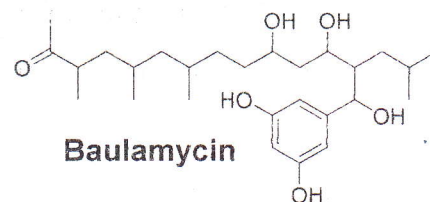
- A) identical B) diastereomers C) enantiomers D) constitutional isomers.

30- The absolute configuration of D-galactose is:

- A) SSSR. B) RSSR.
C) SSRR. D) SRSR.



31- The illustrated structure of baulamycin can exhibit stereoisomers.



A) 49.

B) 25.

C) 16.

D) 64.

32- Which statement is not true about meso compounds?

A) Their stereogenic centers have same configuration.

B) $[\alpha]_{\text{light}}^c$ equals 0° .

C) They are superimposable with their mirror images.

D) There are planes of symmetry.

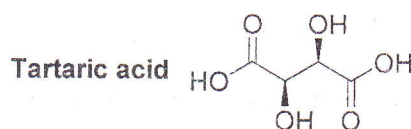
33- is the configuration of the illustrated tartaric acid.

A) SS.

C) SR.

B) RS.

D) RR.



34- What sentence is true about prochirality?

A) A compound has a stereogenic group or unit that is temporarily incorporated into an organic compound to control the stereochemical outcomes of reactions.

B) An achiral compound can be converted to chiral in a single step.

C) A compound can be used to prevent complicated separation.

D) It can be removed from the compound without causing racemization of the desired products.

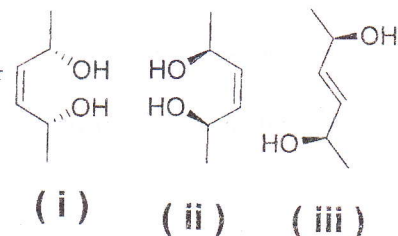
35- Compound rotates the plane of polarized light.

A) I.

B) II.

C) III.

D) I and III.



36- is achiral alkane.

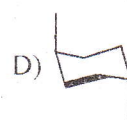
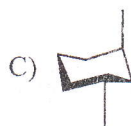
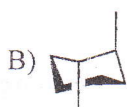
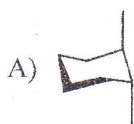
A) 3-Methylpentane.

B) Neohexane.

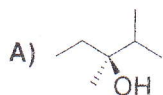
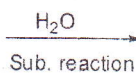
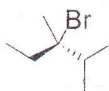
C) 2,3-dimethylpentane.

D) 2,3-Dimethylbutane.

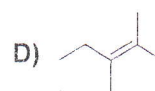
37- is an optically inactive compound.



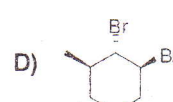
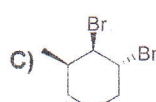
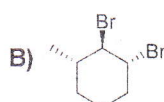
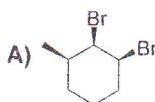
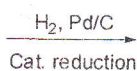
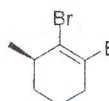
38.

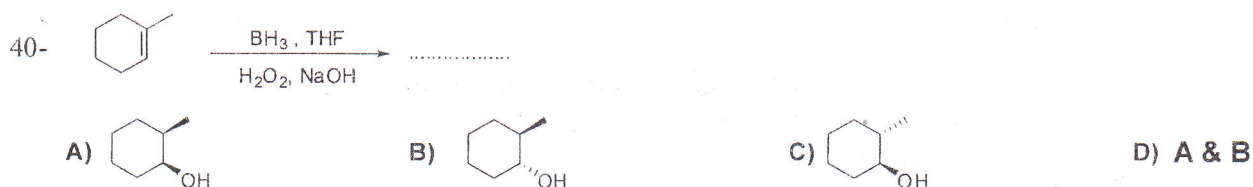


C) A) and B)



39.





Q2: Choose (T) for true sentence or (F) for false sentence: (1 Mark/each)

- 41-The protons in the same methyl group are equivalent. (T / F)
- 42-The protons used to bombard with the sample for which mass spectroscopy has been performed. (T / F)
- 43-There are three sets of equivalent protons for the compound $\text{ClCH}_2\text{CH}_2\text{CH}_2\text{Cl}$. (T / F)
- 44-The molecular ion is the compound that lost a pair of electrons. (T / F)
- 45-The bathochromic shift is the shift of absorption to shorter wave length due to substitution or solvent effect. (T / F)
- 46-DMSO is used as standard reference in NMR spectroscopy. (T / F)
- 47-Number of signals indicates how many "different kinds" of protons are present. (T / F)
- 48-Hypsochromic shift is the shift of absorption to a longer wavelength due to substitution or solvent effect. (T / F)
- 49-Nuclei with $I=0$ are not NMR chromophore. (T / F)
- 50-Intensities of the signals in ^1H NMR spectrum are proportional to number of protons present. (T / F)

Q3: Choose (T) for true sentence or (F) for false sentence: (1 Mark/each) "Oral"

51. 2, 2-Dichloropropane exhibits only one signal in the ^1H NMR spectrum. (T/F)
52. The ^1H NMR spectrum of $\text{CH}_3\text{OCHClCH}_2\text{Cl}$ showed three proton doublet, one proton singlet and two proton doublet. (T/F)
53. Separation of ions in mass spectrometer take place on the basis of Mass to charge ratio. (T/F)
- 54- Chlorine shows two peaks at mass spectrum while bromine shows three peaks (T/F)
- 55- Meta stable peak in mass takes place when ions have lower kinetic energy than normal ions. (T/F)

- 56- The chemically equivalent nuclei are nuclei have identical molecular environments and hence the same chemical shift. (T/F)
- 57- Penta-2,3-diene can rotate the plane of polarized light. (T/F)
- 58- Cis-1,3-dimethylcyclobutane is a chiral compound. (T/F)
- 59- Bromine addition to cis-2-butene results racemic mixture. (T/F)
- 60- *N*-ethyl-*N*-methylbutan-2-amine is a stereoactive compound at room temperature. (T/F)

With best wishes

Dr. Ahmed Abdou O. Abeed and Dr. Ahmed I. Soliman.

Assiut University Faculty of Science Chemistry Department	First Semester Final Examination Instrumental Analysis (C-445) Credit Hours System	Jan 2021 Time: 2 hour
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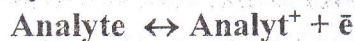
Answer the Following Questions:

Please: In the answer sheet, shade the answer for each question

Question 1: Choose the Correct Answer: (25 Marks)

- The principle use of the hollow cathode lamp in AAS is that:
 - It generates atomic emission lines using laser source.
 - It generates atomic emission lines using the element which is being analysed.
 - It generates atomic emission lines using any element.
 - All of the above.
- Which of the following is/are a/the disadvantage/s of flame atomization?
 - Using nitrous oxide as oxidant.
 - A minimum sample volume of 0.5–1.0 mL is needed to give a reliable reading.
 - Only 15-50% of the nebulizer sample reaches the flame.
 - All of the above.
- Chemical interferences due to formation of species of low volatility in AAS can be eliminated by using of,
 - Higher temperature.
 - Releasing agents.
 - Protective agents.
 - All of the above.
- Which of the following technique is applied in atomic absorption spectroscopy?
 - Thermal conductivity.
 - Electrothermal atomization.
 - Flame ionization.
 - All of the above.
- Which of the following is/are an/the advantage/s of graphite furnace technique?
 - Small sample sizes (as low as 0.5 μ L).
 - Very little or no sample preparation is needed and direct analysis of solid samples.
 - Sensitivity is enhanced (100- 1000 folds).
 - All of the above.
- Instrumental deviation of Beer's Law resulting from the presence of:
 - Higher concentration of the analyte in the solution ($>10\text{mM}$).
 - Association, dissociation and interaction of the analyte with the solvent.
 - Polychromatic radiation or stray radiation.
 - None of these.
- Which is the correct order of events in the process of atomization?
 - Volatilization – Desolvation – Nebulization
 - Nebulization – Desolvation – Volatilization
 - Desolvation – Volatilization – Nebulization
 - Nebulization – Volatilization – Desolvation

8. Ionization of analyte atoms in flame AAS can be eliminated by:



- (a) Increasing the temperature of flame.
- (b) Using oxygen or nitrous oxide as oxidant.
- (c) Addition of potassium salt.
- (d) Addition of releasing agent.

9. Which of the following is not a common interference in AAS?

- (a) Formation of molecules.
- (b) Scattering of source radiation.
- (c) Formation of ions.
- (d) None of the above.

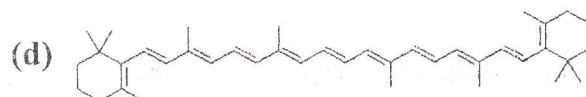
10. The presence of EDTA has been shown to eliminate the AAS interference in,

- (a) The determination of Ca^{2+} in presence of Cu^{2+} .
- (b) The determination of Ca^{2+} in presence PO_4^{3-} or SO_4^{2-} .
- (c) The determination of Ca^{2+} and Al^{3+} .
- (d) All of these.

11. Which of the following is a source of visible radiation?

- (a) Tungsten lamp
- (b) Deuterium lamp.
- (c) Both (a) and (b)
- (d) None of these.

12. Which of the following compounds would have the highest λ_{max} and high value of ϵ ?



13. A solution of CuSO_4 of unknown concentration is placed in a spectrophotometer and an absorbance reading of 0.46 is recorded. Using the same solution cell, a 0.055 M solution of CuSO_4 gives an absorbance reading of 0.34. What is the concentration of the first solution?

- (a) 0.074 M
- (b) 0.35 M
- (c) 0.041 M
- (d) 8.60×10^{-3} M

14. A 2.83×10^{-4} M solution of KMnO_4 has an absorbance of 0.510 when measured in a 0.982 cm cell at 520 nm. Calculate the molar absorptivity for KMnO_4 at this wavelength.
- 35.00 cm
 - 0.35 M
 - $3.5 \times 10^4 \text{ L mol}^{-1} \text{ cm}^{-1}$
 - $3.5 \times 10^5 \text{ L mol}^{-1} \text{ cm}^{-1}$
15. A 5.00 mL urine sample was treated with phosphate reagent to generate a color, following which the sample was diluted to 250 mL. To a second 5.00 mL was added exactly 10.00 mL of a phosphate solution containing 0.0500 mg PO_4^{3-} /mL, which was treated in the same way as the original sample. The absorbance of the first solution was 0.535; that of the second was 0.668. Calculate the concentration in mg of PO_4^{3-} /mL of the sample.
- 0.200 mg of PO_4^{3-} /mL
 - 0.292 mg of PO_4^{3-} /mL
 - 0.402 mg of PO_4^{3-} /mL
 - 0.850 mg of PO_4^{3-} /mL
16. The principle function of a potentiostat is to control
- Potential and measure current
 - Potential and measure time
 - Current and measure potential
17. Various functional groups, such as are reduced in the polarography.
- $\text{C}=\text{O}$ and $-\text{NO}_2$
 - $\text{C}=\text{O}$ and $-\text{OH}$
 - $-\text{N}=\text{N}-$ and $-\text{OH}$
18. The diffusion current in polarography is expressed by
- Randles-Sevcik equation
 - Ilkovic equation
 - Boltzmann equation
19. Current is sampled twice in
- Normal pulse
 - Cyclic voltammetry
 - Differential pulse polarography
20. defined as a time at the end of the potential pulse in which current is measured.
- Pulse amplitude
 - Pulse width
 - Sampling period
21. One of the advantages to measuring the difference current in square wave voltammetry is
- Increase of the discrimination of the charging current
 - Decrease of the discrimination of the charging current
 - The output of the current response is a sigmoidal curve
22. The main instrumental parameter in the is the scan rate.
- Differential pulse voltammetry
 - Cyclic voltammetry
 - Normal pulse

23. Convection current in polarography is eliminated by.....

- (a) Addition of KCl
- (b) Unstirred solution
- (c) Supporting electrolyte

24. In voltammetry, the electroactive species will undergo

- (a) Always oxidation
- (b) Always reduction
- (c) Either oxidation or reduction

25. The drug chlorpromazine, CPZ gives an adsorptive stripping voltammetric peak at a carbon-paste electrode. A 50.0 mL sample containing CPZ yielded a peak height of 0.37 μ A. When 2.0 mL of 3.0 μ M CPZ was spiked to the sample, the peak increased to 0.80 μ A. Find the concentration of chlorpromazine in the sample.

- (a) 0.96 μ M
- (b) 96.0 nM
- (c) 0.096 nM

Answer for Question 1

1	2	3	4	5	6	7	8	9	10	11	12	13
14	15	16	17	18	19	20	21	22	23	24	25	

Question 2: (25 Marks)

Mark True (T) for right statement and False (F) for wrong statement

- 26. The advantages of AAS method is a specific resonance line source is required for each element to be determined i.e. need to use different HCL lamp for each element tested.
- 27. Hydride generation methods is an atomization method used for analysis of highly toxic elements such as arsenic, antimony, tin, bismuth, lead and selenium by using sodium borohydride.
- 28. Cold vapor technique is an atomization method used only to the determination of manganese because it is the only metallic element that has a vapor pressure at lower temperature.
- 29. The photometric titration measurements using UV-visible spectroscopy requires the analyte (A), or titrant (T) or titration product (P) absorbs radiation.
- 30. Standard addition method (spiking the sample) used for analytes in a complex matrix (i.e. blood, sediment, human serum, etc.) where interferences in the UV/Visible for the analyte will occur.

31. UV-visible spectroscopy can be used for quantitative analysis of non-absorbing species when they react with reagent that forms colored products.
32. Transmittance (T) is simply defined as "the fraction of light that reaches a detector after passing through a sample".
33. In the single-beam spectrometer the light from the source, after passing through the monochromator, is split into two separate beams—one for the sample and the other for the reference.
34. Hypsochromic shift (red shift) – a shift to longer λ ; lower energy, whereas, Bathochromic shift (blue shift) – shift to shorter λ ; higher energy.
35. Addition of strontium salt to a calcium solution will reduce the interference by phosphate on the calcium analysis using AAS.
36. Supporting electrolyte is a reactive electrolyte used in electrochemical cells.
37. Auxiliary electrode is used in polarography to reduce the residual current.
38. The presence of O_2 often interferes with the accurate determination of other species.
39. Hg is oxidized; it restricts the use of electrode as cathode.
40. The half wave potential ($E_{1/2}$) can be used to identify the analyte concentration.
41. Heyrovsky-Ilkovic equation determines the number of electrons from the intercept.
42. Working electrode does not enter in the redox reaction while it is so important in keeping a constant reference electrode potential.
43. Solvents used in voltammetry should not undergo electrochemical reactions over a wide range of potential.
44. The potentiostat's internal feedback circuits prevent current from flowing between the working electrode and reference electrode.
45. For reversible systems E_{pa} and E_{pc} are independent on the scan rate.
46. Normal pulse is about 5-10 times more sensitive than differential pulse polarography.
47. Current of polarizable electrode remains unchanged with changes in the electrode potential.
48. Migration is the movement of ions from a region of lower concentration to a region of higher concentration.
49. In anodic stripping methods, the working electrode behaves as a cathode during the deposition step.
50. One important application of amperometry is in the construction of electrochemical biosensors.

26	27	28	29	30	31	32	33	34	35	36	37	38
39	40	41	42	43	44	45	46	47	48	49	50	

Question 3: Oral Exam (10 Marks)

Mark True (T) for right statement and False (F) for wrong statement

51. Real deviations to Beer's law are always appear at low concentration of the absorbing substance (usually $< 0.01M$).
52. A shift to lower wavenumber for an absorption in a spectrum corresponds to a shift to lower wavelength.
53. Formation of oxides species in flame AAS can be suppressed by increase the temperature of the flame (increase atom production).
54. A deuterium lamp is a line source used in atomic absorption constructed of a glass cylinder filled with Ar or Ne containing a cup shaped cathode coated with the metal of interest and an anode constructed of tungsten.
55. Most of the elements that can be determined by atomic absorption spectroscopy are inert gases.
56. Supporting electrolyte should be in large excess of analyte concentration.
57. For reversible systems E_{pa} and E_{pc} are dependent on the scan rate.
58. In normal pulse polarography diffusion layer is thinner than that of DC polarography due to short pulse duration.
59. The principle function of a potentiostat is to control potential and measure current.
60. Polarizable electrode such as DME can take up any potential applied to it.

Answer for Question 3

51	52	53	54	55	56	57	58	59	60

♣♣♣ GOOD LUCK ♣♣♣

Examiners: Prof. Dr. Mohamed Sayed Ibrahim & Dr. Hossieny Ibrahim

Final exam of Chemistry of biomolecules (413C) for double major-chemistry Students
(Chemistry of carbohydrates, amino acids & proteins, Lipids and nucleic acids)

Answer the following questions:

(DIRECTIONS): 1-Read each part of each problem carefully. 2-Blacken the circle that corresponding to your selected answer in the bubble sheet. 3- Answer the third part that includes the oral exam. also in the bubble sheet. 3- More than one response will not be counted.

I. Blacken the corresponding circle to your selected answer in the bubble sheet. (25 Marks)

- 1) Sugars that differ only in their stereochemistry at a single carbon are termed:
a) Epimers. b) Anomers. c) Monomers d) Dimers
- 2) Oxidation of glucose with nitric acid gives:
a) Saccharic acid b) Gluconic acid c) Glucuronic acid d) Glycolic acid
- 3) Lactose is a reducing sugar and consists of:
a) Glucose + fructose, linked 1-2'. b) Two glucose units linked 1-4'.
c) Galactose + glucose linked 1-4'. d) Two glucose units linked 1-5'.
- 4) Maltose is a reducing sugar and consists of:
a) Glucose + fructose, linked 1-2'. b) Two glucose units linked 1-4'.
c) Galactose + glucose linked 1-4'. d) Two glucose units linked 1-5'.
- 5) Cellulose is a polysaccharide composed of several thousand of D-glucose units jointed by:
a) β -(1, 4') glycosidic linkage. b) β -(1, 2') glycosidic linkage.
c) β -(1, 5') glycosidic linkage. d) β -(2, 5') glycosidic linkage.
- 6) Reaction of glucose with excess phenyl hydrazine followed by hydrolysis with conc. HCl gives:
a) Glucosone. b) Phenylglucoazone. c) Fructose. d) D-arabinose.
- 7) Which one of the following acids converts fructose to elemental carbon?
a) conc. H_2SO_4 b) conc. HNO_3 c) conc. HCl d) HBr
- 8) Which one of the following is not reducing sugar?
a) Maltose. b) Lactose. c) Sucrose. d) Glucose
- 9) Osazones are not formed with:
a) Glucose. b) Maltose. c) Lactose. d) Sucrose
- 10) D and L forms are determined by the orientation of the hydroxyl group ($-OH$) around:
a) The pre-last carbon atom b) Last carbon atom c) First carbon
- 11) The gradually change of rotation of α and β anomers of glucose to equilibrium value is called:
a) Epimerization. b) Mutarotation. c) Condensation. d) Saponification.
- 12) Which pair of the following sugars gives the same osazone:
a) Glucose, mannose. b) Glucose, galactose. c) Mannose, galactose. d) glucose, arabinose
- 13) Carrying out the Strecker amino acid synthesis on acetaldehyde gives:
a) Glycine b) Alanine c) Aspartic acid d) Glutamic acid
- 14) The sequence of amino acids in a polypeptide chain is called:
a) Primary structure b) Secondary structure c) Tertiary structure d) Quaternary structure
- 15) Which one of these amino acids is not optically active?
a) Cysteine b) Lysine c) Arginine d) Glycine
- 16) The amino acid has equal tendencies to form either of positively or negatively charged molecules at:
a) The isoelectric point. b) The melting point. c) The boiling point. d) End point.
- 17) Separation of amino acid mixture by Electrophoresis depends on:
a) Solubility. b) Isoelectric point. c) Melting point. d) Boiling point.
- 18) The amino group of amino acids reacts with nitrous acid and converted to hydroxyl group:
a) With liberation of N_2 gas. b) With liberation of CO_2 gas. c) With liberation of CO gas

- (P.T.O) انظر خلفه باقي الاسئلة -

- 19) Rancidity increases as:
- The molecular weight increase.
 - The molecular weight decrease.
 - The number of double bonds increases.
 - The number of double bonds decreases.
- 20) The number of milligrams of KOH required to completely saponify one gram of fat is termed:
- Saponification number.
 - Iodine value.
 - Acid value.
 - Acetyl number.
- 21) The main difference between fats and oils is that oils have:
- Large percent of unsaturated fatty acids.
 - Low percent of unsaturated fatty acids.
 - Large percent of saturated fatty acids.
 - Low percent of hydroxy fatty acids.
- 22) Rancidity of Fats causes:
- Destroying the fat-soluble vitamins and polyunsaturated essential fatty acids.
 - Food poisoning and cancer.
 - Economical loss.
 - All the previous.
- 23) In nucleic acids, the nucleotide monomers linked together *via* a:
- Phosphodiester linkage.
 - Peptide linkage.
 - Glycosidic linkage.
- 24) Mild hydrolysis of DNA gives:
- Nucleotide units.
 - Amino acid molecules.
 - Monosaccharide units.
 - Nucleoside units.
- 25) Which one of the following statements about the Double Helix structure of DNA is **not** true?
- The two strands of DNA were aligned anti-parallel to each other.
 - The two strands of DNA were aligned parallel to each other.
 - The purine and pyrimidine bases of both strands are stacked تتكس inside the helix.
 - There is an interstrand H-bonding between DNA bases of the two strands.

II. In the bubble sheet, blacken (T) for the correct Statement and (F) for the false one: (25 Marks)

- D-glucose and D-galactose are epimers and give the same osazone.
- The sign (+ or -) of rotation is experimental value and not depends on the D or L configuration.
- Reduction of glucose gives sorbitol and mannitol.
- Reduction of glucosone gives fructose.
- Glucose can be converted to galactose by heating with organic base.
- All sugars are carbohydrates but not all carbohydrates are sugars.
- The presence of solid α -amino acid as Zwitter ion explains its high melting points.
- Glycyl-L-alanyl glycine is tripeptide.
- In proteins, the amino acids joined by glycoside linkage.
- All protein-derived amino acids except glycine have at least one stereocenter and are chiral.
- Dialysis is a property, which used to separate proteins from small molecular weight compounds.
- Glycyl alanine and alanyl glycine are the same dipeptide.
- All amino acids containing one amino group and one carboxylic group.
- Amino acids can't be directly titrated against alkalis, because of the interference of the amino group.
- Esterification of glycine with ethanol in presence of hydrogen chloride gives Ethyl glycinate-HCl.
- Proteins are amphoteric depending on the pH of the solution.
- In Gabriel's synthesis, potassium phthalimide is used with halo acids to prepare the amino acids.
- The triesters of fatty acids with glycerol compose the class of lipids known as waxes.
- The iodine value for triolein is equal to zero.
- Soap is the sodium salt of fatty acids.
- Prevention of rancidity is achieved by avoidance of the causes and addition of anti-oxidants.
- The advantages of hydrogenated oil are lack of fat-soluble vitamins and essential fatty acids.
- Nucleoside unit contains pentose sugar, nitrogenous base and phosphate group.
- Unlike proteins, nucleic acids contained no sulfur.
- RNA contains a pentose sugar called deoxyribose.

انظر الورقة الثانية الملحق أسئلة الجزء الشفوي -

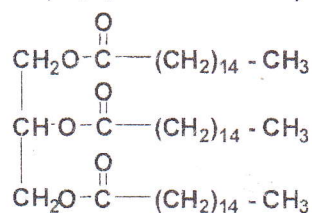
Oral examination part (10 marks)

Choose the right answer for the following:

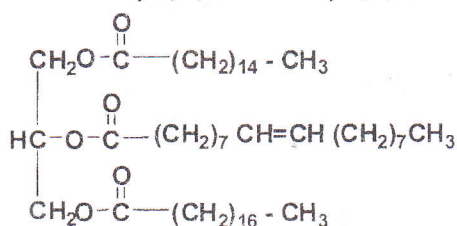
III-Blacken the corresponding circle to your selected answer in the bubble sheet

51) The order of decreasing iodine value for the following triglyceride is:

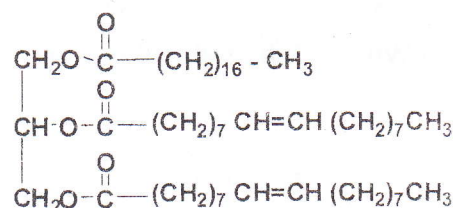
- a) A,B,C b) A,C,B c) C,B,A d) B,C,A



A

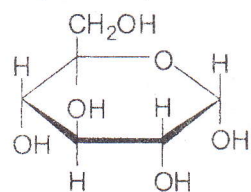


B

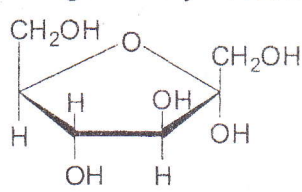


C

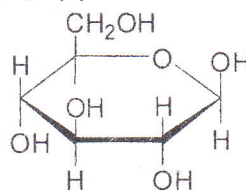
52) Which one of the following carbohydrates is β -D-glucopyranose?



A

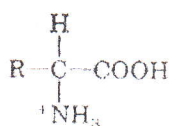


B

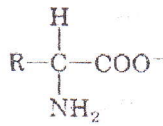


C

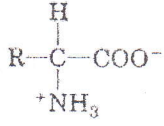
53) Which one of the following is the zwitter ion?



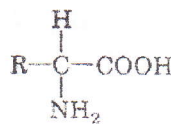
A



B



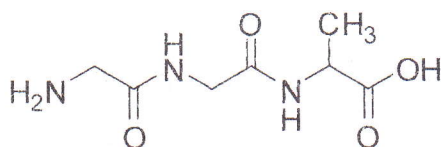
C



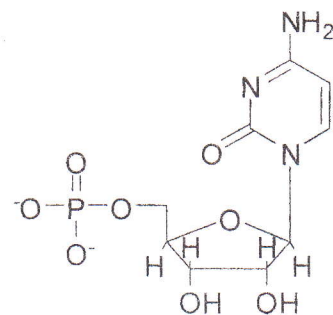
D

54) Which name represents the following tripeptide?

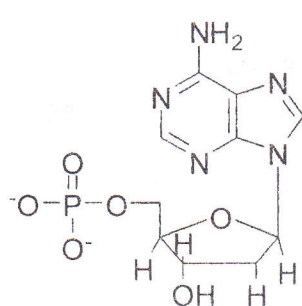
- a) Glycyl glycyl alanine
b) Glycyl alanyl glycine
c) Alanyl glycyl glycine



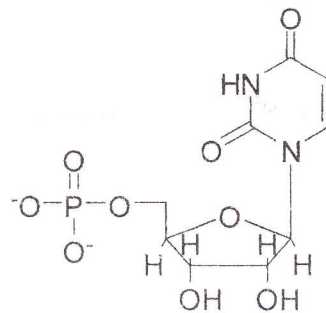
55) Which one of the following nucleotide is Deoxyadenosine-5'-phosphate?



A



B

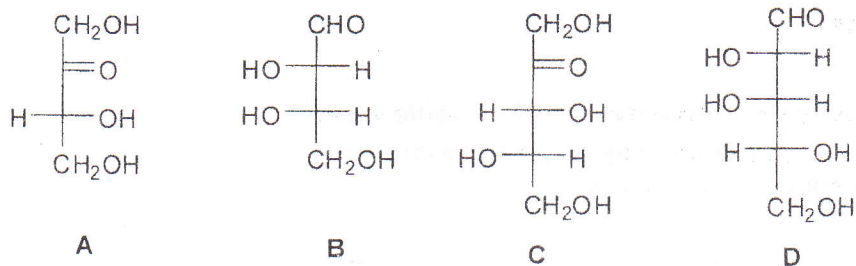


C

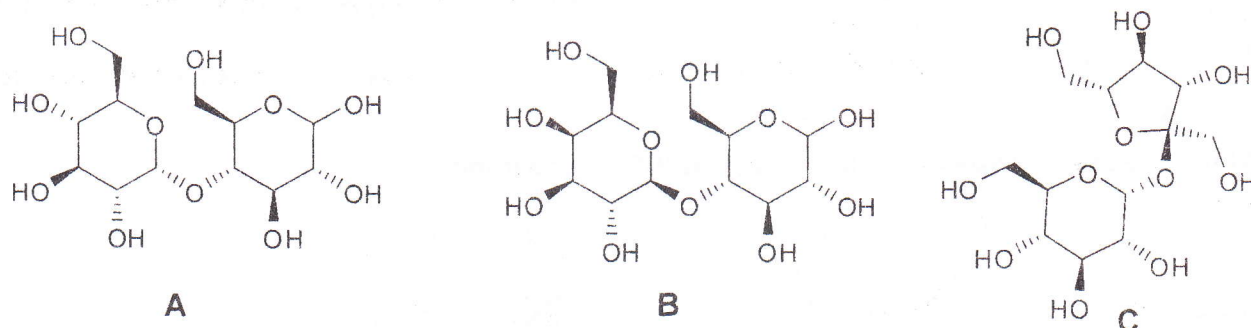
56) Which one of the following fatty acids has the lowest melting point?

- a- $\text{CH}_3(\text{CH}_2)_7\text{CH}=\text{CH}(\text{CH}_2)_7\text{CO}_2\text{H}$
b- $\text{CH}_3(\text{CH}_2)_4\text{CH}=\text{CHCH}_2\text{CH}=\text{CH}(\text{CH}_2)_7\text{CO}_2\text{H}$
c- $\text{CH}_3\text{CH}_2\text{CH}=\text{CHCH}_2\text{CH}=\text{CHCH}_2\text{CH}=\text{CH}(\text{CH}_2)_7\text{CO}_2\text{H}$

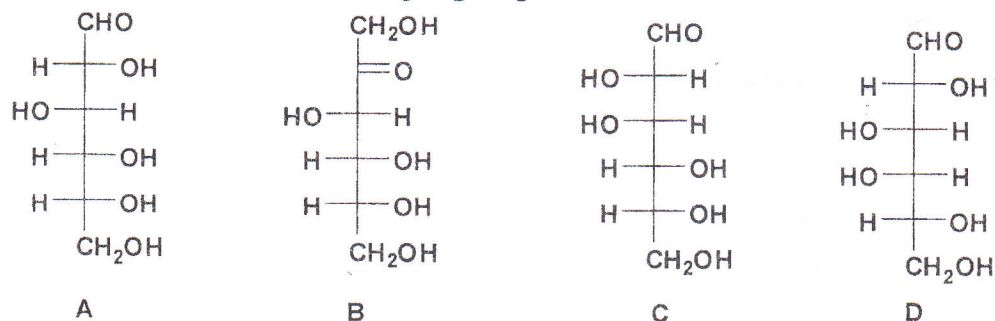
57) Which one of the following monosaccharides is D-aldopentose?



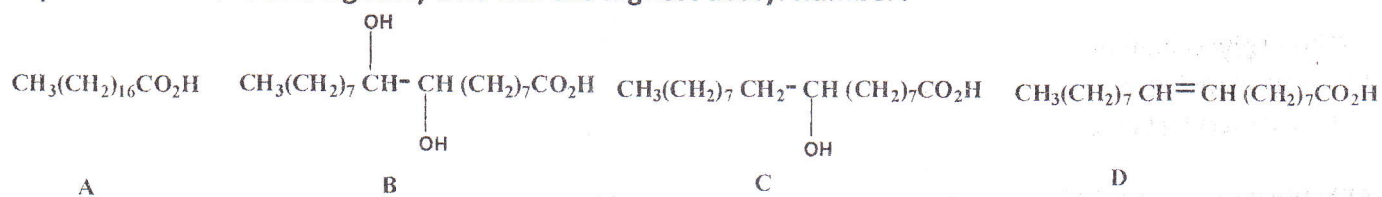
58) Which of the following is non-reducing sugar?



59) Which one of the following sugars gives different osazone?



60) Which of the following fatty acid has the highest acetyl number?



Good luck

Prof. Dr. Mohamed S. Abbady & Dr. Ahmed Mahmoud



Assiut University

Applied Industrial chemistry

Time :2 h

Date: / 2 / 2021



Faculty of Science
Chemistry Department

Answer the Following Questions:

I-) Choose the correct answer

(20 Marks)

1. Selective catalyst should

- (i) Increase the reaction rate (ii) Change the reaction products
- (iii) Increase the number of molecules adsorbed on the catalyst surface
- (iv) Proceed the reaction to desired product

2. What is true for catalytic reaction

- (i) Catalyst increases equally both the rate of forward and reverse reactions
- (ii) Catalyst does not effect to equilibrium constant
- (iii) Catalyst decreases activation energy (iv) Catalyst increases activation energy

3. What is the features of catalytic processes for manufactures of organic compounds

- (i) They are highly exothermic (ii) Certain compound may be explosive
- (iii) The desired product must be stable (iv) All of them

4. Effective catalysts for oxidation reactions are

- (i) Transition metal oxides (ii) Metal halides (iii) Metal with physisorbed oxygen
- (iv) None

5. Preparation of Cu/ZnO/Al₂O₃ as an active catalyst for synthesis of methanol proceeds as.

- (i) The original catalyst was obtained by Co-Precipitation
- (ii) Calcination to decomposition of the primary phases
- (iii) Reduction of the calcined precursor (iv) All of them

6. A basic concept of catalyzed reactions explained by

- (i) The geometrical theories (ii) Electronic theories (iii) Chemical approach
- (iv) All of them

7. The disadvantage of a homogeneous catalysis is.

- (i) Corrosion problems (ii) Poisonous (iii) Expensive (iv) All of them

8. What is not true for desirable characteristic of support

- (i) Desirable mechanical properties (ii) High surface area (iii) Low cost
- (iv) Unstable under reaction and regeneration conditions.

9. What is not true for γ -alumina support.

- (i) Has high surface area (ii) Is relatively stable over the temperature range
- (iii) It can be used as catalyst (iv) It converts to α -alumina at 500°C

10. Selectivity of a catalyst will vary with

- (i) Pressure (ii) temperature (iii) Composition (iv) All of them

11. The industrial catalyst should be characterized by

- (i) High surface area (ii) Mechanical properties (iii) Stability (iv) All of them

12. The addition of a catalyst to a reaction provides an alternate mechanism with

- (i) Lower activation energy and lower reaction rate
- (ii) Lower activation energy and higher reaction rate
- (iii) Higher activation energy and lower reaction rate
- (iv) Higher activation energy and higher reaction rate

13. What is not true of the characteristics of catalytic reactions ?

- (i) The catalyst remains unchanged chemical composition at the end of the reaction.
- (ii) A small quantity of the catalyst.
- (iii) The action of a catalyst is specific to a large extent.
- (iv) A catalyst alter the final state of equilibrium.

14. According to the chemical approach, the desirable energy for decomposition the intermediate complex is:

- (i) High energy (ii) Low energy (iii) Intermediate energy (iv) None

15. What is not true for a good catalyst.

- (i) Selective (ii) Active (iii) Stable (iv) Expensive

16. A Catalyst may lose its activity or its selectivity by

- (i) Poisoning (ii) Block of some pores (iii) creation of active site (iv) All of them

17. The possible mechanism of structural promoter is

- (i) It has a dual-function action
- (ii) The promoter may unchanged the electronic structure of a catalyst
- (iii) The promoter has no effect on the structure of a catalyst
- (iv) the promoter has no effect on the effective activation energy

18. Selectivity of a catalyst will vary with

- (i) Pressure (ii) Temperature (iii) Composition (iv) All of them

19. The factor affecting the precipitation method of a catalyst

- (i) precipitating agent (ii) pH (iii) Temperature (iv) All of them

20. An activated complex has

- (i) Stable and has low PE (ii) Stable and has high PE (iii) Unstable and has low PE
(iv) Unstable and has high PE, [PE, potential energy]

II- Put (✓) or (×) for following sentences

(20 Marks)

1- The turnover number is the number of molecules that react per site per unit time ()

2- The maximum rate of reaction is obtained when the bond between the adsorbed complex and the catalyst surface is too weak ()

3- The basic concept of a catalyst is that of a substance that in large amount causes a large change ()

4- A bifunctional catalyst provides two kinds of sites ()

5- A promoter is a substance which added in relatively large amounts in the preparation of a catalyst ()

6- Structure promoter changes the chemical composition of the catalyst ()

7- A number of solids are acidic and can catalyze a wide variety of reactions similar to those catalyzed by strong mineral acids ()

8- In impregnation method for synthesis of a catalyst requires more equipment ()

9- A support was that of an active substance that provided a means of spreading out of an expensive catalyst ()

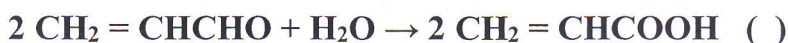
10- Acrylonitrile was manufactured according to the following equation



11- Acrolein was manufactured by the equation



12- The conversion of acrolein to acrylic acid can be written :



13- Ethylene can be oxidized to ethylene oxide with low selectivity over supported silver catalyst ()

- 14- Iron molybdate catalyst $\text{Fe}_2(\text{MoO}_4)_3$ used for conversion of methanol CH_3OH to formaldehyde at a reaction temperature of 200°C ()
- 15- Excess MoO_3 added in preparation of catalyst helps prevent formation of the molybdenum-deficient species ()
- 16- The usual catalyst used for oxidation of SO_2 to SO_3 is vanadia and potassium sulfate supported on alumina ()
- 17- For the oxidation of SO_2 into SO_3 over the commercial catalyst depends on $\text{V}^{3+}/\text{V}^{5+}$ ratio ()
- 18- The first industrial catalyst for the methanol synthesis from CO and H_2 was Zn / Chromium ()
- 19- The most active catalyst for synthesis was used recently is $\text{Cu} / \text{ZnO} / \text{Al}_2\text{O}_3$ ()
- 20- The activity of the most active catalyst independent on the preparation procedures ()
- 21- The number of molecules reacted per unit site per unit volume on catalyst is a selectivity ()
- 22- Granules are prepared simply by grinding and screening ()
- 23- A carrier principally is expensive ()
- 24- A catalyst increases the activation energy of the slowest step in the mechanism ()
- 25- Heterogeneous catalysis can be operated at strong reaction conditions ()
- 26- Homogeneous catalysis is eco-friendly and easy to handle ()
- 27- Calcination of prepared catalysts to eliminate volatile materials. ()
- 28- Almost all chemical industries have one or more steps employing catalysts ()
- 29- Advantages of catalytic processes achieving better economics and productivity ()
- 30- Catalysis and catalysts play one of the key roles in new technology development ()

Oral Examination

III) Put (✓) or (×) for following sentences

(10 Marks)

1. The catalyst increases the rate of reaction called positive catalyst. ()
2. The activity of a catalyst depends upon the strength of chemisorption bonds. ()
3. All catalysts only in high amounts are required. ()
4. Selective catalyst should proceed the reaction to products ()
5. A catalyst may lose its activity or its selectivity corresponding to reaction condition ()
6. A textural promoter is an active substance. ()
7. Effective catalysts for oxidation reactions are metals with physisorbed oxygen ()
8. The disadvantage of a homogeneous catalysis is corrosion problems. ()
9. In Wacker process ethylene is oxidized to formaldehyde. ()
10. Extrusion proceed as a solution is extruded through a die and cut off to form short cylinders ()

----- Good Luck -----

Prof. Dr. Abd Al -Aziz Ahmed Said



Term Exam of Petroleum, Petrochemicals and Chromatography (411C) for the 4th Level Chemistry Students

- Choose the correct answer for all of the following? (50 Marks)

(Final answers must be depicted in the answer sheet not here)

يتم طمس (تسويد) الأجوبة المختارة من قبل الطالب باستخدام القلم الجاف فقط في نموذج الأجوبة الخاص بالطالب
The answer chosen by the student is blurred (blackened) with the ballpoint pen only in his answer form

Section (A): Petroleum Chemistry

- | | |
|---|---|
| 1- The doctor's solution comprises of sodium plumbite in ---.
a) alcohol
b) water
c) aqueous caustic soda
d) soda ash | 2- If the crude is paraffinic then its characterization factor will be ---.
a) 5
b) 8
c) 11
d) above 12 |
| 3- Which of the following will have highest API gravity?
a) Ethane
b) Propane
c) Butane
d) Heptane | 4- Solvent used in the deasphalting process is ---.
a) propane
b) Furfural
c) phenol
d) hexane |
| 5- The value of Watson factor (UOP) of the crude oils gave an indication about ---.
a) Specific gravity
b) carbon Residue
c) aromaticity and paraffinicity
d) Naphthenic contents | 6- In petroleum refining, the process used for conversion of hydrocarbons to aromatics is called ---.
a) catalytic cracking
b) hydrotreating
c) catalytic reforming
d) alkylation |
| 7- Visbreaking process is used mainly for making ---.
a) high cetane Diesel
b) high octane gasoline
c) fuel oil
d) smoke free kerosene | 8- Choose exact sequence of petroleum fractions in order of their boiling points?
a) lubricating oil > Petrol > diesel > LPG
b) lubricating oil > diesel > Petrol > LPG
c) petrol > Lubricating oil > diesel > LPG
d) lubricating oil > Petrol > LPG > diesel |
| 9- The H/C-ratio for the same number of carbon atoms is the highest in case of ---.
a) aromatics
b) naphthenes
c) polycycles
d) olefins | 10- A good lubricant should have high ---.
a) viscosity index
b) volatility
c) pour point
d) none of these |

11- Higher boiling fractions like atmospheric residue, is vacuum distilled at low temperature because at high temperature, there is a tendency of ---.

- a) thermal cracking
- b) gum formation
- c) coking
- d) discoloration

13- If a mixture of 87% isooctane and 13% heptane is burned in a (RON) engine, and create the same knock intensity as the unknown fuel, the octane number of the unknown fuel will be ---.

- a) 87
- b) 44
- c) 78
- d) 90

15- Presence of aromatics in ---.

- a) diesel increases its cetane number
- b) kerosene increases its smoke point
- c) petrol increases its octane number
- a) all (a), (b) and (c)

17- Flash point of an oil gives an idea of the --.

- a) nature of boiling point diagram of the system
- b) amount of low boiling fraction present
- c) explosion hazards
- d) all the above

12- Smoke point of kerosene is the

- a) time after which smoking starts on burning
- b) maximum height of flame (in mm) without causing smoking, when burnt in a standard lamp
- c) temperature at which smoking starts
- d) temperature at which smoking starts on burning

14- The following passive design is used as internals in --- columns.

- a) continuous-contact
- b) simple distillation
- c) staged-contact
- d) open



16- Which of the following is naphthene?

- a) naphthalene
- b) butadiene
- c) cyclohexane
- d) acetylene

18- In alkylation process, which of the following is not used as catalyst?

- a) HF
- b) H_2SO_4
- c) Solid acid catalyst
- d) Mixed acid (H_2SO_4 and HNO_3)

Section (B): Petrochemicals

19- The catalytic air or oxygen oxidation of propylene to acrolein using $\text{Bi}_2\text{O}_3/\text{MoO}_3$ catalyst is called ---.

- a) Sohio process
- b) Shell process
- c) Shift Conversion
- d) Puck process

21- The reaction of CO and H_2 (synthesis gas) catalyzed by zinc-chromium oxide at a high-pressure range (270–420 atm), is used for the production of ---.

- a) butanol
- b) acetaldehyde
- c) Methylamines
- d) methanol

20- The --- used in the production of ethylene glycol by reaction of HCHO with CO in the presence of a strong mineral acid.

- a) DuPont process
- b) Liquid-phase BASF-process
- c) Puck process
- d) Andrussaw process

22- The production of acetic anhydride from acetic acid occurs initially via the formation of --- by lose H_2O , followed by reaction with one mole of acetic acid.

- a) Ethanol
- b) Ketene
- c) Isopropyl acetate
- d) Allyl Alcohol

23- Select the process name describes the conversion of ethylene into ethylene oxide by using $\text{TiCl}_3/\text{H}_2\text{O}$ -catalyst?

- a) Teijin oxychlorination
- b) Shell process
- c) Wacker process
- d) Andrussov process

24- Which catalyst used in the production of HCN, via the reaction of ammonia with methane in absence of air?

- a) platinum/aluminum/ruthenium-catalyst
- b) nickel-catalyst
- c) activated alumina catalyst
- d) zinc oxide-catalyst

25- The best reagent for conversion 1-butene into methyl ethyl ketone MEK is ---.

- a) O_2 , excess H_2
- b) O_2 , $\text{PdCl}_2/\text{CuCl}_2$
- c) O_2 , red phosphorus
- d) LiAlH_4 in ether

26- Oxidation of ethylene by an aqueous solution of PdCl_2 -catalyst give ---.

- a) acetaldehyde
- b) acetic acid
- c) ethanol
- d) ethylene oxide

27- Vinyl chloride results from the reaction of HCl with acetylene in the presence of ---.

- a) $\text{Pd}^{2+}/\text{Cu}^{2+}$ catalyst
- b) Zeolite catalyst
- c) HgCl_2 catalyst.
- d) iron powder catalyst

28- Choose from the following the important intermediate for nylon-66 production?

- a) Propylene chlorohydrin
- b) Acrolein
- c) Adiponitrile
- d) Ethylene glycol

29- Select the correct reagents sequences, used in the three-step reactions for manufacture of glycerol from allyl chloride?

- a) (a) H_2O_2 , (b) NaOH , (c) $\text{Ca}(\text{OH})_2$
- b) (a) HOCl , (b) $\text{Ca}(\text{OH})_2$, (c) H_2O
- c) (a) NaOH , (b) $\text{Ca}(\text{OH})_2$, (c) H_2O
- d) (a) $\text{Cl}_2/\text{H}_2\text{O}$, (b) $\text{Ca}(\text{OH})_2$, (c) HCl

30- Ring opening reaction of propiolactone in the presence of excess alcohol will produce ----.

- a) allyl acetate
- b) mesityl oxide
- c) 2-ethylhexanol
- d) acrylic esters

31- The single cell protein (SCP) term is used to represent a group of microbial cells that have high protein content in which --- serve as the substrate.

- a) n-paraffins
- b) ethylene glycol
- c) ethanolamines
- d) linear alcohols

32- The newer carbonylation process of methanol uses a rhodium complex catalyst and CH_3I as a promoter, is applied for ---- production.

- a) acetic Acid
- b) ethylene oxide
- c) ethylene Glycol
- a) n-Butanol

33- The Puck process used for the production of NH_2NH_2 by oxidation of ammonia in the presence of ---.

- a) NaOCl catalyst
- b) H_2O_2 catalyst
- c) $\text{Ca}(\text{OH})_2$ catalyst
- d) KMnO_4 catalyst

34- Select the correct reaction sequences used for the synthesis of glycerol from allyl alcohol?

- a) epoxidation and hydrolysis reactions
- b) hydrolysis and epoxidation reactions
- c) oxidation and hydrolysis reactions
- d) epoxidation and alkylation reactions

35- The hydroformylations of ethylene oxide yields 3-hydroxypropionaldehyde, followed by hydrogenation of the product will produce ---.

- a) 1,3-propanediol
- b) n-Butanol
- c) vinyl acetate
- d) acrylic acid

36- Hexamethylene tetramine produced by the reaction of formaldehyde with ---.

- a) hydrazine
- b) ammonia
- c) urea
- d) nitric acid

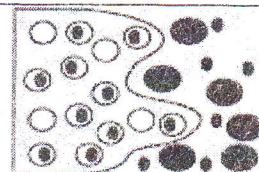
Section (C): Chromatography

37- Chromatography is based on the ---.

- a) different rate of movement of the solute in a column
- b) separation of one solute from other constituents by being captured on the adsorbent
- c) different rate of movement of the solvent in the column
- d) none of the above

38- Name the following separation technique diagram used LC?

- a) Affinity chromatography
- b) Partition chromatography
- c) Size-exclusion chromatography
- d) Ion-exchange chromatography



39- Thin layer chromatography is ---.

- a) partition chromatography
- b) electrical mobility of ionic species
- c) adsorption chromatography
- d) none of the above

40- In gas chromatography, the basis for separation of the components of the volatile material is the difference in ---.

- a) conductivity
- b) partition coefficients
- c) molecular weight
- d) molarity

41- Ion exchange chromatography is based on the ---.

- a) electrical mobility of ionic species
- b) adsorption chromatography
- c) electrostatic attraction
- d) partition chromatography

42- Retention factor, k' , describe ---.

- a) the distribution of an analyte between the stationary and the mobile phase
- b) the migration rate of an analyte through a column
- c) the velocity of the mobile phase
- d) both a and b

43- Complete the following: The ---- is the mobile phase leaving the column.

- a) eluate
- b) elite
- c) elate
- d) elute

44- In the reverse phase chromatography, the stationary phase is made from ---.

- a) non-polar
- b) polar
- c) either non-polar or polar
- d) none of these

45- What useful information can be found from a Van Deemter plot?

- a) The selectivity factor
- b) Optimum mobile phase flow rate
- c) Optimum column temperature
- d) The capacity factor

47- The best method used for quantitative separation of DNA fragments is ---.

- a) Gas chromatography (GC)
- b) Electrophoresis
- c) Column chromatography
- d) TLC

49- If no spots are obvious on TLC plate, the most common visualization technique is to hold the plate under a ---.

- a) UV lamp
- b) Polarimeter lamp
- c) Neon lamp
- d) light emitting diode (LED)

46- Complete the following: An --- ranks of solvents by their relative abilities to displace solutes from a given adsorbent.

- a) Catalyst power.
- b) Eluotropic series
- c) Immobilized phase
- d) Mobile phase

48- Select the most common type of LC detector that measures overall ability of the mobile phase and its solutes to refract or bend light?

- a) Electrochemical detector
- b) Refractive index detector
- c) Conductivity detector
- d) Fluorescence detector

50- The compound eluted last and retained more in normal and reversed phases, this will be ---- respectively.

- a) Polar and Non-polar
- b) Non- polar and Polar
- c) Both are in Polar
- d) Both are in Non- polar



**Final Exam of Chemistry of Petroleum & Petrochemicals
course for (451-C) Students**

Q1: Choose (T) for True sentence or (F) for False sentence (6 Marks)

1. Oil formed closer to the surface is called immature and light.
a) False
b) True
2. Lower API that means more aromatic crudes and lower yields of gasoline.
a) False
b) True
3. Petroporphyrin as composition of petroleum crudes contains V and Ni elements.
a) False
b) True
4. Ammonia was used to reduce the viscosity in desalting processes
a) False
b) True
5. Coking processes is an exothermic reaction
a) False
b) True
6. Rate of decomposition of olefins in catalytic cracking is slightly slower than the thermal cracking
a) False
b) True

Q2: Choose the correct answer A, B, C or D (44 Marks)

7. Catalytic cracking compared to thermal cracking of residue of vacuum distillation of crude oil
a.gives higher yield of gasoline
b.lower octane number of gasoline.
c.higher sulphur content in the product.
d.higher gum forming material in gasoline.
8. Which of the following will have lowest API gravity?
a. Crude oil
b. Diesel
c. Aromatic

d. Gas oil

9. Carbon residue of an oil is determined method

- a. By Conradson method only
- b. By Ramsbottom method only
- c. Either by Conradson method or by Ramsbottom method
- d. By Pensky –Martens(closed)

10. Corrosion in crude distillation unit column overhead system is caused by

- a) The presence of naphthenic acid in crude oils
- b) The presence of HCL formed by dissociation of chloride salts
- c) The sulphur compounds in crude oils
- d) All of the above

11. Which of the following petroleum product has maximum kinematic viscosity at a given temperature

- a. Gasoline
- b. Aviation turbine fuel
- c. Lubricating oil
- d. Furnace oil

12. Aniline point is related to

- a) Octane number
- b) Diesel number
- c) Smoke point
- d) Pour point

13. Which of the following highest-octane number?

- a) n-butane
- b) i-pentane
- c) Octane
- d) Toluene

14. In Alkylation process, which of the following is not used as catalyst?

- a) HF
- b) H_2SO_4
- c) Solid acid catalyst
- d) Mixed acid (H_2SO_4 and HNO_3)

15. The most widely used crude topping column in refineries is the _____ column.

- a) bubble-cap
- b) packed bed
- c) fluidised bed
- d) perforated plate

16. Gum formation in stored gasoline is mainly due to the

- a) Oxidation & polymerization of unsaturates
- b) presence of sulphur

- c) alkylation of unsaturated.
- d) higher aromatic content

17. Catalytic cracking compared to thermal cracking of residue of vacuum distillation of crude oil

- a) gives higher yield of petrol.
- b) lower octane number of petrol.
- c) higher sulphur content in the product.
- d) higher gum forming material in petrol

18. Cetane number of diesel used in trucks may be about

- a) 85
- b) 35
- c) 14
- d) 25-45

19. Smoke point of a kerosene is

- a) Time after which smoking starts on burning
- b) Temperature at which smoking starts
- c) Maximum height of flame (in mm) without causing smoking when burnt in a standard lamp
- d) None of these

20. Which is the most undesirable component in kerosene?

- a) n-paraffins
- b) i-paraffins
- c) Naphthenes
- d) Aromatics

21. Straight run naphtha is converted into high octane number petrol (gasoline) by catalytic

- a) Cracking
- b) Reforming
- c) Isomerization
- d) Polymerization

22. Solution used in Doctor's treatment for the removal of mercaptans is

- a) Sodium plumbite
- b) Sodium hydroxide
- c) Cupric chloride
- d) Potassium isobutyrate

23. Which of the following has the lowest viscosity (at a given temperature) of all?

- a) Naphtha
- b) Kerosene
- c) Diesel
- d) Lube oil

24. In petroleum refining, the process used for conversion of hydrocarbons to aromatics is

- a) catalytic reforming
- b) alkylation
- c) catalytic cracking
- d) Hydrotreating

25. The main aim of cracking is to produce

- a) Gasoline
- b) Lube oil
- c) Petrolatum
- d) Coke

26. Catalyst used in alkylation process is

- a) Sulphuric acid
- b) Nickel
- c) Silica gel
- d) Alumina

27. Tetraethyl lead is added to the petrol to increase its octane number, because its octane number is

- a) More than 100
- b) Round about 100
- c) Between 50 and 100
- d) Less than 25

28. The reservoir rock containing petroleum has

- a) Low porosity
- b) High permeability
- c) High porosity
- d) Both B and C

29. Which is the most effective catalyst used in catalytic cracking of petroleum products?

- a) Iron oxide
- b) Nickel
- c) Vanadium pentoxide
- d) Zeolite

30. Good quality kerosene should have

- a) Low smoke point
- b) High smoke point
- c) High aromatics content
- d) Low paraffins content

31. Alkylation

- a) Causes olefins to combine with each other
- b) Causes olefins to combine with iso-paraffins
- c) Converts iso-paraffin into olefin
- d) Converts olefin into paraffin

32. Which is the most ideal feed stock for coking process used for the manufacture of petroleum coke?
- Naphtha
 - Vacuum residue
 - Light gas oil
 - Diesel
33. ----- base crude oil is also called asphaltic base crude
- Paraffinic
 - Naphthenic
 - Mixed
 - Aromatic
34. Catalytic cracking compared to thermal cracking of residue of vacuum distillation of crude oil
- Gives higher yield of petrol
 - Lower octane number of petrol
 - Higher sulphur content in the product
 - Higher gum forming material in petrol
35. Diesel index is defined as
- $(^{\circ}\text{API}) \times (\text{Aniline Point}, ^{\circ}\text{F})/100$
 - $(^{\circ}\text{API}) \times (\text{Aniline Point}, ^{\circ}\text{C})/100$
 - $(^{\circ}\text{API}) \times (100)/\text{Aniline Point}, ^{\circ}\text{F}$
 - $(^{\circ}\text{API}) \times (100)/\text{Aniline Point}, ^{\circ}\text{C}$
36. Catalyst used in isomerisation process is
- H_2SO_4
 - H_3PO_4
 - HF
 - AlCl_3
37. Paraffin base crude oil as compared to asphalt base crude gives
- Higher yield of straight run gasoline
 - Higher octane number gasoline
 - Lower viscosity index lube oil
 - Poorer yield of lube oil
38. In petroleum refining, the process used for conversion of hydrocarbons to aromatics is
- Catalytic cracking
 - Catalytic reforming
 - Hydrotreating
 - Alkylation
39. The most important property for a jet fuel is its
- Viscosity
 - Freezing point
 - Calorific value
 - Flash point

40. Hydrocracking employs

- a) High pressure & temperature
- b) Low pressure & temperature
- c) High pressure and low temperature
- d) High temperature and low pressure

41. Pressure & temperature maintained in catalytic cracking is about

- a) 2atm & 500°C
- b) 10atm & 500°C
- c) 30atm & 200°C
- d) 50atm. & 750°C

42. Crude oil is subjected to vacuum distillation in the last stage, because

- a) High boiling point products like heavy fuel oil & lubricating oils are heat
- b) sensitive and may decompose
- c) Lighter/low boiling products are prone to thermal decomposition
- d) High purity products can be obtained= thereby
- e) None of these

43. Sweetening of petroleum product means the removal of

- a) Sulphur & its compounds
- b) Water
- c) Organic impurities
- d) Wax

44. The main reaction in reforming is the

- a) Dehydrogenation of naphthenes
- b) Hydrogenation of naphthenes
- c) Hydrocracking of paraffins
- d) Saturation of olefins

45. Petroleum is believed to have originated from _____ Sources.

- a) Vegetable
- b) Animal
- c) Both A & B
- d) Neither A nor B

46. In sweetening process, solutizing agent used with caustic alkali is

- a) Potassium Chloride
- b) Sodium plumbite
- c) Methanol
- d) Phenol

47. Sulphuric acid treatment of petroleum products removes the----- materials.

- a) Gum forming
- b) Color forming

- c) Asphaltic
- d) All of the above

48. Quinoline is a/an _____ compound.

- a) Sulphur
- b) Nitrogen
- c) Oxygen
- d) None of these

49. Which of the following has the lowest flash point of all?

- a) Diesel
- b) Kerosene
- c) Gasoline
- d) Furnace oil

50. The octane number of aviation gasoline may be

- a) 87
- b) 97
- c) 79
- d) >100

Oral Exam.

Q3: Choose the correct answer A, B, C or D (10 Marks)

51. Petroleum

- a) Is optically active
- b) Constitutes mainly of olefins
- c) Does not contain asphalt
- d) Does not contain aromatics

52. Presence of aromatics in

- a) Diesel increases its cetane number
- b) Kerosene increases its smoke point
- c) Petrol increases its octane number
- d) All of the above

53. Which of the following processes is used for the production of petroleum coke?

- a) Stabilisation
- b) Visbreaking
- c) Cracking
- d) Reforming

54. Concentration of catalyst in alkylation is kept between 90-95%, because having concentration

- a) Less than 90% promotes polymerisation
- b) More than 95% promotes reduce the yield
- c) Both A & B
- d) Neither A nor B

55. Visbreaking

- a) Uses natural gas as feed
- b) Is carried out at atmospheric pressure
- c) Produces fuel oil of lower viscosity
- d) Produces gasoline only

56. Which of the following contains maximum sulphur?

- a) Diesel
- b) Petrol
- c) Kerosene
- d) Fuel oil

57. Naphthenic acid is a/an _____ compound.

- a) Sulphur
- b) Nitrogen
- c) Oxygen
- d) None of these

58. Aromatics are desired constituents of

- a) Lubricating oil
- b) Diesel
- c) Kerosene
- d) gasoline

59. Viscosity index of a lubricating oil

- a) Is the measure of its flash point
- b) Is the measure of variation of viscosity with temperature
- c) Should be low
- d) None of these

60. Which of the following order of petrol knocking is true?

- a) aromatics > branched paraffins > olefins > cyclo paraffins > aromatics
- b) straight chain paraffins > olefins > branched paraffins > cyclo paraffins > straight chain paraffins
- c) straight chain paraffins > branched paraffins > olefins > cyclo paraffins > aromatics
- d) straight chain paraffins > branched paraffins > olefins > aromatics > cyclo paraffins

Best Wishes
Prof. Abdel-Aal Gaber

C- 441 Analytical & Bioanalytical Chemistry Final Exam for
Level Four (Special Chemistry Group)

Answer the Following Questions on the provided bubble sheet. (50 marks)

(A) Tick (✓) to the right sentence and (X) to the false one. (25 marks)

1. Chromatography works by allowing the solvent present in the mixture to be distributed between the mobile and stationary phases.
2. The key factors that affect electro-osmotic mobility are dielectric constant and viscosity of buffer.
3. DNA is a nucleic acid that contains the chemical instructions used in the development and functioning of all known living organisms and some viruses.
4. Sensors are devices designed to permit continuous measurement of a quantity.
5. Antibodies are widely used as recognition elements in fiber-optical biosensor applications due to the high correlation of the binding reaction between an antibody and an analyte (antigen).
6. In the biosensor of the intrinsic type, the antigen is immobilized at the fiber core surface where it is allowed to bind with a labeled antibody.
7. Gas sensors for carbon dioxide and ammonia in aqueous solution have been constructed based on a gas-permeable membrane and an optical pH sub-sensor.
8. Analyte concentrations measurable with various types of biosensors range from 10^{-15} mol L⁻¹ (biocatalytic sensors) to as little as 10^{-7} mol L⁻¹ (affinity sensors).
9. In the biocatalytic reaction specific binding is accomplished between the active site of the enzyme and the substrate (recognition process), conversion of the substrate to product, and release of the product from the active center, which in turn leads to regeneration of the binding affinity and catalytic state of the enzyme.
10. The following analytes cannot be detected and measured by immunoassay: hormones (pregnancy-related steroids), clinical disease markers, drugs (therapeutic and abused), bacteria, and such environmental pollutants as pesticides.
11. Electrophoresis is based on the differential migration of electrically charged particles in an electric field.
12. According to the Debye -Hückel theory, the total charge Q of a particle is correlated to the dielectric constant ϵ and to the zeta potential ζ by the expression: $Q = \epsilon r \zeta$
13. Cellulose acetate is still very popular in clinical chemistry, as it offers a ready-made support that can be equilibrated with buffer in a few seconds and produces good separations of proteins from biological fluids in ca. 20 min.

14. Chemometrics is the use of mathematical and statistical methods to improve the understanding of chemical information and to correlate quantity parameters or physical properties to analytical instrument data.
15. Statistical process control (SPC) is a method of quality control which employs statistical methods to monitor and control a process.
16. The most important tests used in water-quality surveillance or quality control in large communities are those for microbiological quality (by the measurement of indicator bacteria) and turbidity and for free chlorine residual and pH where chlorination is used.
17. Combined chlorine is less reactive but more persistent species formed by the reaction of free chlorine species with organic material and ammonia.
18. Analytical quality assurance comprises all the steps taken by a laboratory to assure those who receive the data that the laboratory is producing false results.
19. The plate number N is calculated according to: $N = 5.54 (t_R/w_h)^2$ where t_R is the retention time and w_h is the peak width at half height.
20. Narrow bore columns with i.d.'s ranging from 0.1 to 0.05 mm provide very low efficiencies or long analysis times.
21. The importance of the stationary phase in GC can be deduced from the resolution equation.
22. Chemical ionization is very useful to elucidate the molecular ion of unknowns and is often the ionization method of choice for quantitative mass spectroscopy via ion monitoring.
23. The selectivity of HPLC is not based on the different types of stationary phases; it is based on the mobile phase only.
24. Fluorescence detection provides high selectivity and sensitivity, which is the reason for its use in trace analysis, the high selectivity results from the fact that only a few analytes are able to fluoresce.
25. The internal standard method is well known from Gas Chromatography and should always be used if exact control of the injection volume is not possible.

B) Multiple Choice Questions: (25 marks)

26. Method detection limits must:
 - a) performed initially for certification, Annually
 - b) meet criteria specified in method
 - c) performed with change in instrumentation or test method
 - d) All the above.
27. Surrogates are:
 - a) similar to an internal standard,
 - b) added to all analytical samples, and to all QC samples to monitor method performance,
 - c) most common in organic methods.
 - d) All the above.
28. Laboratory Control Sample is also known as:
 - a) Laboratory Fortified Blank (LFB)
 - b) Quality Control Sample (QCS)

- c) a, b.
 - d) None of the above
29. Recovery Studies includes:
- a) Matrix Spikes
 - b) Laboratory Control Samples
 - c) Surrogates
 - d) All the above.
30. Laboratory Reagent Blanks should:
- a) Contain every reagent used in the analysis
 - b) not subjected to all analytical procedures
 - c) give signal above detection limit
 - d) All the above.
31. Sample Batch is:
- a) 10 - 20 samples or less
 - b) Same matrix
 - c) Same sample prep and analysis, contains a full set of QC samples
 - d) All the above.
32. Internal standards are:
- a) A compound chemically similar to the analyte, Not expected to be present in the sample
 - b) Can interfere in the analysis
 - c) Added to the calibration standards not to the samples in identical amounts.
 - d) All the above.
33. The Criteria of the ICV are:
- a) It must be performed after the initial calibration via the analysis of a mid-level standard.
 - b) The working calibration standards and the ICV standard must be from independent sources (e.g. from two different manufacturers).
 - c) Its recovery should be within 90% to 110% for inorganic analyses and within 80% to 120% for organic analyses.
 - d) All the above.
34. Factors influencing the quality of analytical chemistry data:
- a) reagents stability, integrity and efficiency
 - b) equipment reliability, specificity & sensitivity of selected test
 - c) documentation, proficiency of personnel, use of appropriate controls
 - d) All the above.
35. Between 50 and 80% of HPLC applications are run in the RP mode and only 10 to 20 % in the NP mode because:
- a) The reproducibility of the elution strength of the mobile phase is difficult in RP chromatography.
 - b) Re-equilibration between the mobile and stationary phases is much faster in the RP mode (after three to five column volumes) than in NP chromatography, especially if water was added.
 - c) RP columns combined with gradient elution are able to separate a wide range of analytes (from hydrophobic to polar components)
 - d) All the above.
36. Factors to be considered in choosing an appropriate mobile phase for a specific LC problem:
- a) Solubility of the sample in the eluent, polarity of the eluent
 - b) Light transmission of the eluent, refractive index of the eluent
 - c) Viscosity, boiling point of the eluent
 - d) all the above

37. Good LC detector should have the following characteristics:
- low sensitivity and detection limit, Good selectivity
 - Fast response and Wide range of linearity
 - contribute to column band broadening
 - All the above.
38. The plate number can be increased by:
- reducing the particle size of the stationary phase d_p and thus the achievable plate height
 - lengthening the column.
 - a, b.
 - None of the above
39. In GC MS, the following are the techniques commonly used for quantitative analysis:
- the normalization method,
 - the external and internal standard methods,
 - the standard addition method and
 - All the above.
40. The basic parts of a gas chromatographic system are:
- the carrier gas supply,
 - the injector, the column, and
 - the detector.
 - All the above.
41. A GC chromatogram provides:
- The retention time of the components in the column that can be used for qualitative interpretation or component identification.
 - The detector's response which is proportional to the amount of separated sample component and gives quantitative information on the composition of the mixture
 - Both (a) and (b).
 - None of the above.
42. Color in drinking-water may be due to the presence of :
- colored organic matter, e.g. humic substances,
 - metals such as sodium and potassium, or
 - Non- colored industrial wastes.
 - All the above.
43. Types of chlorine residual measurement include:
- free chlorine* (the most reactive species, i.e. hypochlorous acid and the hypochlorite ion);
 - combined chlorine* (less reactive but more persistent species formed by the reaction of free chlorine species with organic material and ammonia); and
 - total chlorine* (the sum of the free and combined chlorine residuals).
 - All the above
44. Analytical test report must contain at least the following information for each air contaminant:
- Name, address of reporting organization or individual
 - date, time and place of measurements
 - the test method used and details of any deviation from that method
 - All the above
45. Key tools used in statistical process control include:
- run charts,
 - control charts,
 - a focus on continuous improvement, and the design of experiments.
 - All the above.
46. Techniques in multivariate calibration are often broadly categorized as:
- classical or

- b) inverse methods.
 - c) a, b
 - d) None of the above
47. Polyacrylamide Gels are popular from several fundamental properties:
- (a) optical clarity, including ultraviolet (200 nm) transparency:
 - (b) electrical neutrality, due to the presence of charged groups: and
 - (c) availability in a wide range of pore sizes.
 - (d) all the above.
48. The mobility is directly proportional to:
- a. stability constant
 - b. zeta potential
 - c. directly related to the solvent viscosity.
 - d. All the above.
49. Biosensor research must be directed toward the following points:
- a) Protein engineering, with the aim of enhancing the stability of enzymes, catalytic antibodies, and bifunctional enzymes
 - b) Screening stable enzymes from microorganisms (extremophiles)
 - c) Utilization of antibody fragments (Fab, Fab'), bispecific antibodies, and single- chain and single- domain antibodies (tailored through genetic engineering and its expression in bacteria)
 - d) a, b and c.
50. The most important parameters for characterizing or validating a chemical sensor or a biosensor include:
- a) Selectivity.
 - b) Sensitivity and Limit of Detection
 - c) Stability of the Analytical Function (Drift)
 - d) All the above

Good Luck

Examiner: Prof. Nagwa Abo El-Maali

Answer the Following Questions:

Tick (✓) to the right sentence and (X) to the false one on the provided bubble sheet. (10 marks)

51. In the chromatographic column, molecules that spend most of their time in the mobile phase are carried along faster.
52. Glucose oxidase is used to determine glucose on the basis of bind oxygen that is consumed.
53. Labeling of antibodies or antigens with urease or alkaline phosphatase and subsequent addition of a fluoro- or chromogenic substrate leads to detectable production of fluorophores or chromophores.
54. Biosensors based on the antigen - antibody interaction are called immuno-probes.
55. In a free buffer solution, in the absence of molecular sieving, the velocity v of a particle is proportional to the field strength E , multiplied by its electrophoretic mobility μ : $v = \mu E/2$.
56. Chemometric techniques are particularly heavily used in analytical chemistry and metabolomics, and the development of improved chemometric methods of analysis continues to advance the state of the art in analytical instrumentation and methodology.
57. Due to the relatively high density of nitrogen compared to helium and hydrogen, longitudinal diffusional spreading of the solutes in nitrogen is small, but the resistance to mass transfer in the mobile phase is high. In contrast, for low-density gases such as helium and especially hydrogen, longitudinal diffusional spreading is large but resistance to mass transfer small.
58. GC can be used only for samples that can be volatilized without decomposition at temperatures up to ca. 700°C.
59. Diode-array detectors can record spectra simultaneously every few milliseconds at different points of an elution band (peak) during a chromatographic run.
60. A "calibration verification" is analyzed with each batch of samples (ICV) because many methods require that daily calibration curves are prepared.

Good Luck

Examiner: Prof. Nagwa Abo El-Maali



Assiut University
Fourth & Third Levels
Fungal Physiology
Two Hours



Botany & Microbiology Department
Microbiology and Chemistry & Microbiology
No. 363N
50 Marks



Faculty of Science
First Term
16-3-2021
Final Examination

I. Answer by True (T) or False (F) in the Following Statements [25 Marks "One mark for each"]:-

1. Saprophytic fungi obtain their foods from their host or living organisms.	(T) & (F)
2. Chitin is a polymer of <i>N</i> -acetyl-D-glucosamine found in all fungal cell walls.	(T) & (F)
3. All fungi live as thermophiles.	(T) & (F)
4. Osmophilic fungi live on fruit juice and Jams.	(T) & (F)
5. Azole compounds affect the cell wall biosynthesis.	(T) & (F)
6. All fungi can live until 0.3% CO ₂ concentration but 1% CO ₂ kills the fungi.	(T) & (F)
7. Fungicide is inhibiting the fungal growth but fungistatic is killing the fungus.	(T) & (F)
8. All the cell organelles in fungi participate in the fungal growth process.	(T) & (F)
9. Yeasts live as strongly acidic fungi but the <i>Agaricus bisporus</i> lives as alkalophilic.	(T) & (F)
10. Ideal volume of the medium in growth vessels must be 1/5 for good aeration.	(T) & (F)
11. Internal factors include the specific fungal characters.	(T) & (F)
12. Cu is a macroelement for synthesizes the fungal cytochromes and enzymes activity.	(T) & (F)
13. We can obtaine the pure fungal culture by selection of the substrate, sterilization, cultivation, determination of the growth and preservation.	(T) & (F)
14. Xerophilic fungi grow on dried grains and seeds.	(T) & (F)
15. Lichens represent the symbioses relationships between fungi and bacteria.	(T) & (F)
16. Photoaxis is the response of zoospores in phycomycetes under the effect of light.	(T) & (F)
17. The fungus grows very poorly in pure culture but produce their precithium when grown in mixed culture with other fungus which is called assist relationship.	(T) & (F)
18. <i>Saccharomyces cerevisiae</i> cannot live without oxygen.	(T) & (F)
19. Sterols are the fungal 2ry metabolites that act as protective layers against light.	(T) & (F)
20. Proto-trophic fungi have the ability to synthesize their growth vitamins as co-factor.	(T) & (F)
21. Fungal sensory response to gravity is called anemotropism.	(T) & (F)
22. Surface cultures are formed when we incubate the culture in agitated incubator.	(T) & (F)
23. Zinc is a microelement responsible for the enzyme activity.	(T) & (F)
24. Submerged fungal cultures give homogenous growth.	(T) & (F)
25. Environmental factors include macro- & micro-element, co-factors, and other chemicals.	(T) & (F)

Select the most correct answer in the following [25 Marks "One mark for each"]:-

- 26. Pyscrophilic fungi tolerate the low temperature by**
a) cold shock protein b) unsaturated fatty acids c) polyols d) all choices are correct
- 27. Spores and old fungal cell walls have**
a) amorphous glucans b) thick wall with lipids and pigments c) chitin d) pigment
- 28. The radiations have many effects on the fungal cell such as**
a) mutation b) enhancement or inhibit the fungal growth c) destructive d) all choices are correct
- 29. pH value divides the fungi into**
a) strongly acidophilic b) slightly acidophilic c) true alkalophilic d) all choices are correct
- 30. Glucose act as solo carbon source andhas glucose and biotin.**
a) peptone b) cysteine c) starch d) all choices are correct
- 31. The adaptation phase in the fungal growth curve includes**
a) adaptation b) digestive enzymes excretions c) nutrient uptake d) all choices are correct
- 32. You can detect and determine the fungal growth by..... method.**
a) linear b) dry weight c) all choices are correct d) total nitrogen and total sterols
- 33. Arrangement of the fungal cell wall layers includes.....**
a) micro-febrile b) amorphous carbohydrate polymers and glycoprotein's
c) discrete layer of protein d) all choices are correct
- 34. The relationships between fungi and other living organisms includes.....**
a) parasitic b) saprophytic c) symbiotic d) all choices are correct
- 35. The classification of the fungal tropism includes.....**
a) phototropism b) chemotropism c) thigmotropism d) all choices are correct
- 36. Effect of light on fungi includes fungal.....**
a) morphology and physiology b) movement c) development d) all choices are correct
- 37. The importance of fungal cell wall**
a) protection b) mechanical support c) shape of the fungal cell d) all choices are correct
- 38. N_2 is anin fungal nutrition.**
a) macroelement b) macroelement for build all the nitrogenous compound c) co-factors d) microelement

39. Growth of some fungi on a complicated substrate convertes it into very simple substrates which benefits for other fungi called.....relationship.

- a) saprophytic b) assist c) synthesis for another d) metabiosis

40. The fungal secondary metabolites are synthesized

- a) when the nutrient exhausted b) excess of C are presence
c) for building the tolerated units d) all choices are correct

41. Fungal physiology is identify as.....

- a) all the bioprocess occure inside the fungal cell b) all choices are correct
c) interaction between fungi and environment d) interaction between fungi and living organisms

42. All bioprocess havecardinal points.

- a) One b) two c) three d) four

43.are the protective layers against harmful effects of light such as pigments.

- a) Photoreceptors b) Carbohydrates c) Sterols d) Lpids

44. Halophilic fungi like the high concentration of salt and grow on

- a) salted fish and meats b) NaCl c) pickles d) all choices are correct

45. Aspergilli growth curve have ... growth phases

- a) seven b) three c) four d) five

46. Water content are very important for fungal growth for

- a) solubilization of the outer nutrient b) digestive enzyme activities c) nutrient uptake.
d) all choices are correct

47. Growth Co-factors for fungal growth include

- a) vitamin b) amino acids c) sterols d) all choices are correct

48. *Diplodia* is grow on starch but not on glucose because.....

- a) It doesn't have the diastase enzyme b) starch is contaminated by protein
c) starch has biotin as co-factors d) all choices are correct

49. Fungi are classified into separate kingdom and have many similarties with

- a) plant b) animal and insect c) prokaryotic cells d) all choices are correct

50. Factors affecting fungal growth includes factors.

- a) external and internal b) envieronmental c) nutritional d) all choices are correct



Final Exam. for "Environmental Analytical Chemistry" (C-343)

First Question: Put (✓) or (x) in front of the following sentences: (30 Marks)

- 1- Chlorofluorocarbons released in the atmosphere are responsible for destruction of ozone layer in stratospheric layer. ()
- 2- Biotic components in environment includes light, water and temperature. ()
- 3- The decrease of temperature with increasing height in troposphere is called negative lapse rate. ()
- 4- The temperature rises from -56° to -2°C in mesosphere region. ()
- 5- Carboxy peptidase enzyme works by catalysing the hydrolysis of terminal peptide link at the end of the peptide chain. ()
- 6- Calcium ions form a complex with ATP and are constituents of phosphohydrolases enzymes involving ATP and energy release. ()
- 7- Organic matter components are responsible for increasing the fertility of soil. ()
- 8- Fertilizers include nitrate and phosphate ions. ()
- 9- In highly acidic soils, the bacterial population decreases and the population of fungi increases. ()
- 10- The micronutrients that are present in the soil include carbon, hydrogen, nitrogen and potassium. ()
- 11- Parathion is one of organochlorine insecticides ()
- 12- Carbamate insecticides are less toxic and less resistance than organophosphate insecticides ()
- 13- Carboxin belongs to non-systemic fungicides. ()
- 14- Picloram is considered one of contact herbicides. ()
- 15- Nylon 66 and Teflon are examples of thermosetting plastics. ()
- 16- Polyvinyl chloride is one of thermoplastics. ()
- 17- The chemical structure of thermosetting plastic is altered by heat and products formed can not be resfotened. ()
- 18- Toluene-2,4-diisocyanate is responsible for liver cancer. ()
- 19- The formation of ozone is essential for sustaining life on earth by preventing the harmful UV radiations from reaching the sun. ()
- 20- The green plants absorb CO_2 gas from the atmosphere to prepare carbohydrates via photosynthesis process. ()
- 21- The mixture consisting of HCl and HNO_3 get condensed on the solid particulate matter of smoke present in air is called classical smog. ()
- 22- The formation of carboxy-haemoglobin leads to anoxia and paralysis. ()
- 23- The acid rain makes the soil more acidic and responsible for destroying fertility of soil and damage of leaves of plant and trees. ()
- 24- The oxides of sulfur present in atmosphere destroys more than 60% of ozone in the atmosphere. ()
- 25- Both absorption or adsorption methods can be used for collection of particulate matter samples. ()
- 26- The detection limits with a graphite furnace are 100 times better than those from a conventional flame. ()
- 27- The efficiency of separation of mixture using High Performance Liquid Chromatography (HPLC) method depends on the choice of the solvent. ()
- 28- Biomass energy is non-renewable energy source used for sailing and for irrigation ()
- 29- The cattle dung used to produce gas (biogas) contains 25% of inflammable methane gas. ()
- 30- The boiling range needed for diesel oil is lower than that for kerosene oil after fractional distillation of crude oil. ()

أنظر خلفه باقي الأسئلة
الاختبار النظري في ورقتين (1-2)
والاختبار الشفوي في ورقة رقم (3)

Second Question: Put (✓) or (x) for the following sentences:

(20 Marks)

- 31- The liquid form of water is lighter than its solid form; it expands by about 8% when it freezes and become less dense. ()
- 32- Water has one of the highest surface tension values, by which it could moderate the biosphere temperature. ()
- 33- Detergents that possess a linear chain are less biodegradable than those having branched carbon chain. ()
- 34- Lake at higher level will have a lower value of dissolved oxygen than one near the sea level. ()
- 35- The BOD value of industrial wastewater discharged from paper industry is usually higher than that of the food industry. ()
- 36- Plain sedimentation is more effective for the removal of total suspended matter than chemical precipitation. ()
- 37- Carbon adsorption is selective toward the removal of certain organic contaminants such as volatile organic compounds (VOCs). ()
- 38- Reverse osmosis membranes are effective in the removal of all particles (suspended or even dissolved salts). ()
- 39- Refractory organic compounds are known to be easily removed by conventional treatment methods. ()
- 40- Secondary treatment is merely a physical process designed to remove organic contaminants. ()
- 41- The objective of preliminary treatment processes is to remove heavy large inorganic solids in order to protect the operation. ()
- 42- Flotation and skimming units are among the preliminary treatment processes, however, coagulation and flocculation units are among the primary treatment. ()
- 43- Trickling biofilters uses anerobic microorganisms to metabolize the organic contaminants. ()
- 44- COD is more representative of amount of organic matter in wastewater than BOD. ()
- 45- API separators are more effective than CPI ones in oil removal. ()
- 46- Amount of dissolved oxygen is crucial for effective removal of organic matter through the activated sludge process. ()
- 47- Bio-Methylation process performed by microorganisms called methanogenic bacteria under aerobic conditions. ()
- 48- The most toxic form of mercury is the vapor form because it enters the brain through the blood stream causing damage to the central nervous system. ()
- 49- Phosphate based detergents are the main reason behind the growth of algae (eutrophication). ()
- 50- Control of oil pollution in seas by skimming could be applied long after oil spills. ()

"Good luck"

Examiners: Dr. Ahmed M. Kamal & Dr. Haitham M. El-Bery



Oral Exam. for "Environmental Analytical Chemistry" (C-343)

First Question: Put (√) or (x) in front of the following sentences: (5 Marks)

- 51- The greater importance of Inductively Coupled Plasma/Atomic Emission Spectrometry (ICP/AES) is ability of analyzing multi elements simultaneously. ()
- 52- The poisoning effects of lead ions may cause paralysis, blindness and chromosom breakage. ()
- 53- Organo Tin compounds can be used in boat and ship hull coatings. ()
- 54- Agrochemicals include fertilizers and herbicides. ()
- 55- Adipic acid can be used for the formation of Teflon. ()

Second Question: Put (√) or (x) for the following sentences: (5 Marks)

- 56- Natural water is slightly basic due to sodium carbonate that comes from dissolved CO₂. ()
- 57- Organomercurials are non-toxic form of mercury unlike mercurous ions. ()
- 58- CPI separators can handle high flow and shock loads than API separators. ()
- 59- Self-purification of water is directly proportional with the amount of DO. ()
- 60- Anaerobic biological treatment produces methane as useful byproduct of the wastewater treatment process unlike aerobic treatment. ()

"Good luck"

Examiners: Dr. Ahmed M. Kamal & Dr. Haitham M. El-Bery

Final Inorganic Chemistry Exam(C-321) For Third Level Students

Question Number One:

(17 marks)

- a- Define the effective atomic number rule saying.
b- Calculate the effective atomic number for the following complexes and clarify if it obeys the rule or not.
 $[\text{Ni}(\text{CO})_4]$, $[\text{Fe}(\text{CN})_6]^{3-}$
 c) Write the formula of the following complexes.
 - Dicyanotetrammineplatinum(IV)tetrachloroplatinate(II).
 - Hexamine- μ -hydroxo- μ -amidodicobalt(II) chloride.
 - Sodium μ -dihydroxo-tetra oxalato dichromate(III).
 d) Write the IUPAC name of the following complexes.
 (i) $[\text{PdI}_2(\text{ONO})_2]$
 (ii) $[\text{Co}(\text{en})_2\text{NH}_3\text{Br}]\text{Cl}$
 (iii) $\text{K}[\text{Pt}(\text{NH}_3)\text{Cl}_5]$
 e) What kinds of isomerism that compound (ii) above can possess?
 f) In the light of HSAB concept, predict which direction the following reactions will go?
 (i) $\text{CoF}_2 + \text{HgBr}_2 \rightleftharpoons \text{CoBr}_2 + \text{HgF}_2$
 (ii) $\text{HgO} + \text{H}_2\text{S} \rightleftharpoons \text{HgS} + \text{H}_2\text{O}$

Question Number Two

(17 marks)

- A) For only six put ($\checkmark$) in front and expect those wrongs ones put (x) in front with error correction found that . (6Marks)

- 1- Ferric oxide is more acidic than ferrous oxide
- 2- Chromyl chloride is forming by dissolving chromium (IV) dioxide
- 3- Zinc metal dissolve in excess of acidic solution to gives zincate ions
- 4- The complexes are formed from weak field ligands have low spin
- 5- The most common oxidation state of currency group being Cu(II) ; Ag(II) ; Au(III)
- 6- Manganese (VII) heptaoxide is strongly basic and ionic
- 7- Highest oxidation state of ferric ions equal $[\text{Ar}]3d^64s^0$

- B) Choose the correct answer for only six of the following :

(6Marks)

- 1- Cadmium hydroxide is in bases :
 a- Soluble ; b- insoluble ; c- sparingly soluble
- 2- Coperous oxide reacts with the halogen acids gives insoluble:
 a- CuX ; b- CuX_2 ; c- Cu_2X (X= Cl^- ; Br^- ; I^-)
- 3- The equivalent weight of KMnO_4 in strong base equal:
 a- $\text{M.wt} / 5$; b- $\text{M.wt} / 3$; c- M.wt (M.wt= Molecular weight)
- 4- Mn_3O_4 is a mixed oxide from :
 a- $\text{MnO.Mn}_2\text{O}_3$; b- $\text{Mn}_2\text{O.MnO}_3$; c- $\text{Mn}_2\text{O.MnO}_2$
- 5- $[\text{Ni}(\text{H}_2\text{O})_6]^{+2}$ has the unpaired electrons equal :
 a- 2 ; b- 3 ; c- zero

أقلب الصفحة

6- The chemical formulae of Prussian blue is:

a- $\text{KFe}^{\text{III}}[\text{Fe}^{\text{II}}(\text{CN})_6]$; b- $\text{KFe}^{\text{II}}[\text{Fe}^{\text{III}}(\text{CN})_6]$; c- $\text{K}_2\text{Fe}[\text{Fe}(\text{CN})_6]$

7-Cobalt (II) ions are easily oxidized in

a-Alkaline medium ; b- acidic medium c- natural medium

C) Explain why for only three of the following :

(3Marks)

1- $[\text{CoBr}_4]^{-2}$ is tetrahedral while $[\text{Co}(\text{DMG})_2]^{-2}$ is square planar

2- Mn^{+2} ions more stable than Fe^{+2} ions

3-Silver chloride is diamagnetic and colorless

4- hydrated cobalt chloride is used as a test for water

D) Describe a method for preparing only two of the following:

(2Marks)

1-Chromium trioxide (III) from ammonium dichromate

2-Potassium manganate from potassium hypomanganate

3-Ferrous oxide from iron (II) oxalate

Question Number Three:

(16 marks)

1- Give reason(s) for the following:

(5 marks)

i- Ionic radius of $\text{Sc}^{3+} < \text{Y}^{3+} < \text{La}^{3+}$ but that of $\text{Ti}^{4+} < \text{Zr}^{4+} \approx \text{Hf}^{4+}$.

ii- Transition metals have variable oxidation states.

iii- Cr, Mo and W are very hard metals while Zn, Cd and Hg are not hard.

iv- V_2O_5 has acidic character while VO is basic.

v- Ni(II) is more stable than Pt(II).

2- Write briefly on ONLY TWO of the following:

(4 marks)

i- Vanadic acids and their salts.

ii- Extraction of pure titanium from its rutile ore.

iii- Uses of vanadium.

3- Write using equations how magnetic moment of a substance can be measured from magnetic susceptibility.

(3 marks)

4- Answer ONLY TWO of the following:

(4 marks)

i- Explain how Fe(VI), Mn(VII) and Cu(I) can be stabilized.

ii- From Mn, Al, C, Bi, Fe, V and N write the available alloys and interstitial compounds.

iii- If the absorption of green light by $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ ion takes place at $\lambda = 5000 \text{ \AA}$, what is the colour of this ion and the energy associated with this wavelength.

Oral question:

(10Marks)

i- The magnetic moment (in B.M.) of Fe^{2+} is

a) 5.92 b) 3.87 c) 4.90 d) 1.37

ii- Cr, Mo and W have higher melting points than Mn, Tc and Re [True or False]

iii- Complete and balance the following equations:



iv-Account number of unpaired electrons of Fe^{+2} and Fe^{+3} ions when reaction weak and strong field ligands

(N=14; Cr=24; Mn=25; Fe=26; Co=27; Ni=28; Cu=29; Zn=30; Cd=48; Ag=47 ; Au=79; Kr=36)

اد سحر الجيار- اد اسماء ابراهيم- اد سعيد ابراهيم- اد محمد البجهمي.

Good Luck

Photochemistry and Reactive intermediates (313 C)
Final Exam for The 3rd level Students

Note: Support your answer with Chemical equations whenever possible.

Answer on the Following Three Sections: (50 + 10 Marks)

Section (A) Photochemistry: (25 Marks)

Answer on the Following Questions:

I]- Answer only Three of the following: (3 x 3 = 9 Marks)

- 1- Describe the selection rule with special reference to spin forbidden transitions.
- 2- Describe the methods used for determination the reaction mechanism in Photochemistry with special reference to the product Quantum yield method .
- 3- Discuss the mechanism of sigmatropic rearrangement induced by light.
- 4- Explain the photochemical mechanism of vision.

II]- Mark right (✓) or wrong (X) on only Four of the following statements and

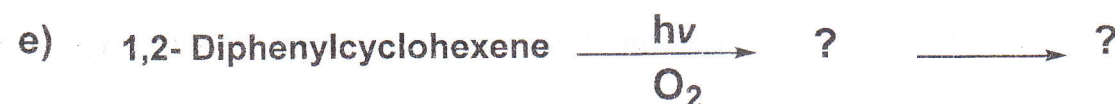
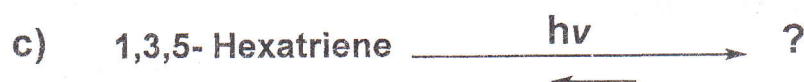
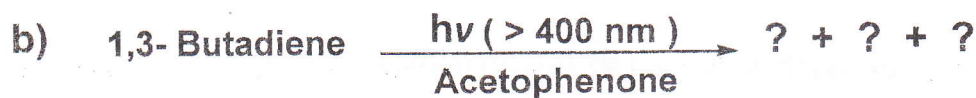
Explain your answer:

(2 x 4 = 8 Marks)

- 1- Quartz filter transmitting ≥ 100 nm radiations can be used in Visible light photolysis of organic compounds. ()
- 2- Photochromism is a nonreversible process induced by light. ()
- 3- Ungerade $\rightarrow$ Gerade transition is a Spin allowed transition. ()
- 4- Photopolymerization of 1- butene has a Product Quantum Number *less than one*. ()
- 5- U.V. radiations have lower frequency than Microwave. ()

ملحوظة هامة: الأسئلة 3 صفحات.

III]- Complete *only Four* of the following reactions and discuss the reaction mechanism: (2 x 4 = 8 Marks)



Section (B) Reactive Intermediates:

(25 Marks)

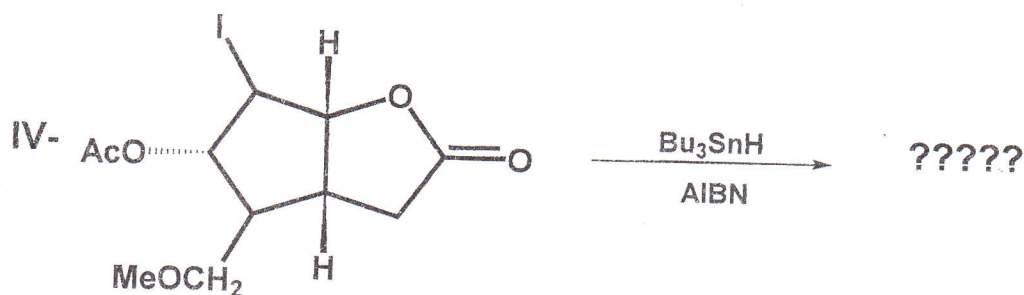
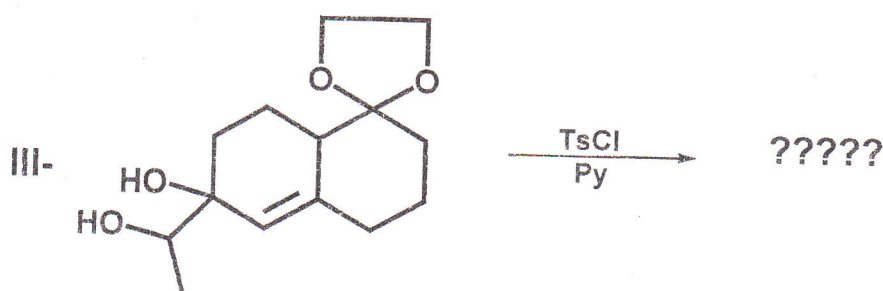
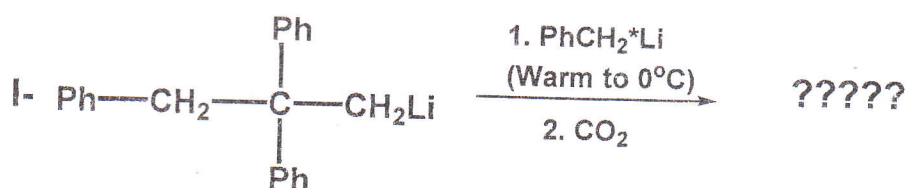
Answer on the Following Questions:

1) Write on two only of the following (use equations): (2 x 5 = 10 Marks)

- It is possible to prepare benzyl methyl ether from trans-stilbene.
- The tetramethylphosphonium ion undergoes deuterium exchange in $\text{D}_2\text{O}/\text{OD}^-$ 106 times as fast as does the tetramethylammonium ion.
- A carbon radical has seven electrons in its valence shell, while carbocation has only six. (Explain this statement)

- 2) Suggest the suitable mechanism and products for Only Three of the following reactions. Write the name of the suggested mechanism indicating each step using arrows.

(3 x 5 = 15 Marks)



Section C : For Oral Examination:

(10 Marks)

Put right ($\checkmark$) or wrong (X) on the following statements, and Explain you answer :

- 1-Photocatalytic reactions are promoted only by Emission of light. ()
- 2-Oxygen has an important role in photochemical reactions. ()
- 3- The methyl cation is substantially more stable than benzyl cation. ()
- 4- In carbenes intermediates, the carbene carbon is linked to two adjacent groups by covalent bonds and possesses two nonbonding electrons which may have antiparallel spins, this state known as (singlet state) . ()

Prof. Dr. Aboel-Magd A. Abdel- Wahab & Prof. Dr. Mona A. Abdel -Rahman *Good Luck*